

**ANNUAL REPORT**

OF THE

**DEPARTMENT OF THE INTERIOR**

FOR THE

**FISCAL YEAR ENDED MARCH 31, 1921**

PRINTED BY ORDER OF PARLIAMENT



OTTAWA  
F. A. ACLAND  
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY  
1922



ANNUAL REPORT

OF THE

*To His Excellency The Right Honourable Lord Byng of Vimy, G.C.B., G.C.M.G.,  
M.V.O., etc., Governor General and Commander in Chief of the Dominion of  
Canada.*

FOR THE

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the report of the transactions of the Department of the Interior for the fiscal year ending March 31, 1921.

Respectfully submitted,

C. A. STEWART,

*Minister of the Interior.*

OTTAWA, August 16, 1921.

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REPORT  
OF THE  
DEPARTMENT OF THE INTERIOR

1921

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OTTAWA, December 22, 1921.

Hon. CHARLES STEWART,  
Minister of the Interior,  
Ottawa.

SIR,—I have the honour to submit the 48th Annual Report of the Department of the Interior for the year ending March 31, 1921.

In the three Prairie Provinces, the department has surveyed to date 200,280,209 acres of land, of which 35,572,128 acres are in Manitoba, 79,025,551 in Saskatchewan and 85,682,530 in Alberta. Of the surveyed area, 25,649,800 acres were available for entry on January 1, 1921. A large portion of the unsurveyed area has not yet been explored.

An analysis of the land situation shows that 2,892 soldier land grant entries, alienating approximately 462,720 acres, were made during the year. In addition, 458,925 acres have been withdrawn from forest reserves and handed over to the Soldier Settlement Board since the Forest Reserves Amendment Act became law in July, 1919.

The number of free homestead entries has decreased slightly, but, on the other hand, the railway companies during the year sold nearly 8,000,000 acres of land at an average selling price of over \$20 per acre. The Hudson's Bay Company sold 178,300 acres at an average price slightly in excess of \$17 per acre, whilst over 200,000 acres of school lands were disposed of by the department at about \$15 an acre.

Irrigation surveys in the more southerly portions of Alberta and Saskatchewan, where irrigation is most needed, have been practically completed and attention is now being given to the more northerly areas. A drainage division of the Reclamation Branch was organized during the past year and the department is now in a position to make surveys for applicants and prepare plans for reclaiming low and flooded areas. The Waterhen Lake project, in which the drainage of a large area of Crown lands is involved, is now in course of construction.

During the year a Dominion Hydrometric Survey was organized. Survey work of this description in Alberta and Saskatchewan had formerly been carried on by the Reclamation Branch, and this was transferred to the Water Power Branch, which now has supervision over a Dominion-wide service for measuring water resources.

Prospecting and mining operations have been active. Northern Manitoba is coming into prominence as a mining area and shipments of ore in quantity are being made to western smelters. Discovery of high-grade silver-lead ore in the Yukon is



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attracting attention. An indication of the value of this ore is found in the fact that it is shipped about 5,000 miles and undergoes five transshipments, before it reaches the smelter.

Great activity has prevailed in prospecting and drilling for oil in the Mackenzie District, Northwest Territories, and the western provinces, following the bringing in of the Discovery well near Fort Norman. The department has established a staff of technical officers at Calgary to close wells that the operators are unable to control and to furnish technical advice generally. Coal mining operations have assumed large proportions, the output increasing to approximately 7,000,000 tons.

The department has perfected an organization for the supplying of information on natural resources which is proving of great assistance to those interested in development. A record is being made of unoccupied privately-owned lands in every province to assist in bringing these under cultivation.

The publicity which has been given to the National Parks and the improving of the roads has resulted in a large increase in the number of visitors. During the year approximately 150,000 visitors entered the parks. Of these, fully one-third were from foreign countries.

The herds of buffalo owned by the Dominion Government in Alberta have increased to such an extent that about 1,000 buffalo will be slaughtered. This will bring in considerable revenue.

Splendid progress is being made in the work of preserving historic sites of national importance. A Dominion-wide historical survey is being made to decide which sites are of national importance. To date forty-six sites have been selected to receive attention. Over thirty historical societies are co-operating with the department in this work.

New features are being introduced for the protection of forests. While more fires started during the past year than during any previous year, the more efficient fire-fighting service prevented any increase in losses. A novel feature is the introduction of aeroplane patrols, provided in co-operation with the Air Board.

Increasing numbers of farmers in the Prairie Provinces are availing themselves of the facilities of the Forest Nursery Station at Indian Head in supplying seedlings for shelter belts.

The Forest Products Laboratories at Montreal are supplying useful information in the utilization of wood and wood products. Manufacturers and builders are enabled to put each wood to its best use and new uses are being discovered for woods formerly thought to have a narrow range of utility.

The total revenue of the department from all sources during the year was \$10,189,596.52, an increase of \$286,875.30 over 1919-20.

Immediately following, you will find a synopsis of the work of the various branches to preface the more detailed statements submitted by the heads of branches.

I have the honour to be, sir,

Your obedient servant,

W. W. CORY,  
*Deputy Minister.*



SESSIONAL PAPER No. 25

REPORT OF THE CONTROLLER OF THE LANDS PATENT BRANCH,  
N. O. COTE

## LETTERS PATENT

The number of letters patent issued during the last fiscal year was 17,957, covering an area of 2,753,494 acres, being an increase of 215 letters patent and a decrease in the area patented of 35,403 acres as compared with the total area of the previous year. Made up by provinces as follows:—

Province	Patents	Acres
Manitoba.. . . . .	2,601	397,426
Saskatchewan.. . . . .	8,550	1,338,332
Alberta.. . . . .	6,370	979,662
British Columbia.. . . . .	376	37,902
Yukon Territory.. . . . .	40	70
Northwest Territories.. . . . .	10	102
	<u>17,947</u>	<u>2,753,494</u>

## HOMESTEAD ENTRIES

Five thousand three hundred and eighty-nine entries were granted during the year, aggregating an approximate area of 862,240 acres, being a decrease of 1,343 in the number of homestead entries granted as compared with the previous year.

By Provinces—	Homestead entries
Manitoba.. . . . .	725
Saskatchewan.. . . . .	1,670
Alberta.. . . . .	2,874
British Columbia.. . . . .	120
	<u>5,389</u>

There were 2,892 soldier grant entries made during the year, aggregating approximately 462,720 acres, made up by provinces as follows:—

	No. of entries	Acres
Manitoba.. . . . .	475	76,000
Saskatchewan.. . . . .	1,188	190,080
Alberta.. . . . .	1,171	187,360
British Columbia.. . . . .	58	9,280
	<u>2,892</u>	<u>462,720</u>

There were 373 sales made during the fiscal year for 15,239.42 acres of land, with an average for each sale of about 40½ acres.

## ACCOUNTS AND REVENUE

During the fiscal year \$1,704,412.27, including \$319,491.25 interest on deferred payments, was received on account of purchased homesteads and pre-emptions and ordinary sales, being a decrease of \$1,014,651.45 as compared with the payments received during the previous year.

One hundred and twenty-one thousand eight hundred and twenty-nine dollars eighty-nine cents has also been received for entry fees, improvements and sundries, making a total revenue for the fiscal year of \$1,826,242.16.

Refunds were made amounting to \$76,324.02, as follows:—

Value of improvements collected on cancelled homesteads.. . .	\$60,083 12
Overpayments on sales; and of moneys paid on account of purchased homesteads and pre-emption sales, entries for which had been cancelled.. . . . .	\$16,240 00



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SCHOOL LANDS DIVISION, W. T. ROLLINS

During the fiscal year ended March 31, 1921, school lands were disposed of by sale at public auction: to the Soldier Settlement Board, to railway companies, and to school districts as follows:—

Province	Area	Value	Average per acre
Manitoba... ..	10,462.55 acres	\$ 130,975 42	\$12 51
Saskatchewan... ..	84,404.77 "	1,234,057 69	14 62
Alberta... ..	122,536.44 "	2,165,850 05	17 67

The net revenue derived for the three provinces for the fiscal year was as follows:—

Manitoba... ..	\$ 408,349 99
Saskatchewan... ..	2,830,172 05
Alberta... ..	1,204,723 23
Total... ..	<u>\$4,443,245 27</u>

The amount paid to the Government of each province, after deducting the expenditure, was as follows:—

Manitoba... ..	\$ 76,711 36
Saskatchewan... ..	627,631 45
Alberta... ..	338,261 63
Total... ..	<u>\$1,042,604 44</u>

The expenditure incurred was as follows:—

Manitoba... ..	\$ 15,874 61
Saskatchewan... ..	47,967 94
Alberta... ..	38,504 76
Total... ..	<u>\$102,347 31</u>

The amount standing to the credit of the fund of each province as on March 31, 1921, was as follows:—

Manitoba—	
Total amount at credit of fund... ..	\$ 5,497,538 31
Amount invested in Debenture Stock... ..	5,497,000 00
Balance at credit of fund... ..	<u>\$ 538 31</u>
Saskatchewan—	
Total amount at credit of fund... ..	\$10,985,410 99
Amount invested in Debenture Stock... ..	10,984,000 00
Balance at credit of fund... ..	<u>\$ 1,410 00</u>
Alberta—	
Total amount at credit of fund... ..	\$ 6,159,146 38
Amount invested in Debenture Stock... ..	6,159,000 00
Balance at credit of fund... ..	<u>\$ 146 38</u>

NATURAL RESOURCES

INQUIRIES REGARDING NATURAL RESOURCES

Inquiries and communications on all kinds of natural resources and collateral subjects were received and dealt with in the Natural Resources Intelligence Branch to the number of 20,304; and 184,423 pieces of printed matter, including booklets and maps, were distributed in the same connection.

Replies are handled with increasing speed and in fuller detail owing to the up-to-date information carefully accumulated in a card index, which also serves as the basis



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of the technical memoranda, special reports and pin-maps. The Natural Resources Intelligence Branch continues to receive valuable aid from the many federal and provincial departments with which it constantly co-operates.

By the courtesy of the organizers of the "Imperial Press Conference," which represented the leading journals throughout the Empire, two members of the branch, fully competent to give information on Canadian resources, accompanied the trains conveying the delegates in the tour of 1920. All the maps and much of the printed information in use were prepared in the branch.

The branch in the course of its service prepared for the Canadian Pacific Railway the nineteen-foot electrically illuminated map of Canadian resources which was a leading feature of the National Chemical Exposition in New York in September, 1920, and has since been exhibited at Glasgow and at the Canadian National Exhibition in Toronto. The increasing volume of departmental work included the completion of the "Resources Map of the Dominion," the first edition of which is already exhausted.

The Natural Resources Intelligence Branch has been entrusted with the printing and development of the photographic films of the Canadian Air Board. Besides routine and mosaic work, special research was involved in correlating negatives taken from airplanes with the precise geodetic survey. Three hundred decorative panels were prepared for the new Houses of Parliament.

## NORTHERN ALBERTA AND THE MACKENZIE BASIN

Of outstanding importance has been the oil strike at Oil Creek in August, 1920. The great activity in the Norman, Great Slave and Pouce Coupe fields that is expected to follow this discovery will direct attention to the other opportunities for development in these northerly regions.

Land can be farmed successfully in by no means a small way throughout a large portion of the Mackenzie basin as far north as Great Slave lake. Operations over a number of years at such trading posts as Resolution, Fort Smith and Fort Vermilion have proved that the same agricultural success will prevail in these areas as in those lying more southerly, such as Peace River, Waterhole, Pouce Coupe, Spirit River, and Grande Prairie, which have been much favoured by returned soldiers.

Interest was also directed in 1920 to the zinc and lead ores near Great Slave lake and a shaft was sunk. More active development is expected in the summer of 1921 in this field. Among other mineral deposits occurring in northern Alberta and the Mackenzie district of the Northwest Territories are gypsum, coal, salt, copper, gold and bituminous sands. The drilling operations in 1920 at McMurray by the Alberta Government revealed thick beds of excellent salt.

In addition to oil and other minerals the abundant supplies of excellent food fish and the wealth of fur-bearing animals give to this new north a further potential value.

## NORTHERN SASKATCHEWAN

In 1920 exploratory work was conducted by the Provincial Government in the northern part of Saskatchewan. Coal outcrops were found on Bowtree river, flowing into lac la Ronge, and cliffs of white sand along the south shore of Wapawekka lake. Many of the collected mineral specimens showed gold, silver, copper and asbestos. The area near the interprovincial boundary west of Flin Flon lake promises to be a rich mineral zone. In 1920 considerable interest was shown in the Pasquia Hills oil shale district. This was largely as a result of a reported oil strike.

From Prince Albert to The Pas the country is thickly wooded, though merchantable timber is very scattered. The large lumber mill at The Pas, Manitoba, depends upon Saskatchewan for nearly all its timber.



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The fisheries company at Big River, 90 miles northwest of Prince Albert, made excellent progress in 1920 and has already established a great market for its white-fish in eastern Canada and the United States.

## NORTHERN MANITOBA

In keeping with general conditions prevalent in the Dominion there has been comparatively little activity.

The abnormal prices for fur obtained by trappers in 1919-20 no longer prevailed and fishermen, prospectors and strangers who had in the past season joined the hunt returned to their regular occupations. The production of fur is estimated, however, at a million dollars.

With a return of fishermen, fishing is again on the increase, and for the first time a sturgeon industry on a commercial scale has been undertaken on the Churchill river.

The mineral production has been comparatively small. Copper shipments to Trail were mainly products of the previous year and are for the present discontinued while the question of railway and smelter for The Pas district is under consideration. Much development has been done in blocking out large bodies of ore, the result of which will appear in time.

## EASTERN CANADA

Canada west of lake Ontario is an increasing subject of inquiry and the department is in constant co-operation with the Provincial Governments in helping to develop their resources by correspondence, lectures, slides and various publications. The work progressing in the hinterland of Quebec, north of the St. Lawrence especially, is becoming widely known, and the exploitation of the oil shales of New Brunswick and Nova Scotia is a matter of a narrowing distance of time.

The members of the Imperial Press Conference, to which two members of this department were attached for service, could not fail to carry away with them much up-to-date information about the eastern part of the Dominion, which, though earliest settled, is perhaps less familiar in detail to the resident abroad. The industrial possibilities of the east with its large supplies of water, coal, iron and lime, its oil shales, lumber, pulpwood, fisheries and a specialty in asbestos, when considered in relation to its unequalled facilities for shipment to all countries on the Atlantic seaboard, ensure that its present output and population will be multiplied manifold.

## LAND RESOURCES

The area of the Dominion is nearly three and three-quarter million square miles, divided into nine provinces and the Yukon and Northwest Territories. Water surfaces cover 3.37 per cent of the total area. Large areas are underlaid by coal and other mineral deposits, but the total surface area required for their operation is limited.

It is usual to consider our land resource of chief value so far as it forms the basis for agriculture, and in this connection a great many influences, outside of the natural fertility of the soil, have to be taken into consideration. There is a prevalent belief that farms will always follow the destruction of forest areas, but while it is true that the fine agricultural soils of the older provinces were at one time covered by forests, Canada has reached the stage where only a small percentage of the land now covered by timber growth is of any agricultural value.

The area suitable for cultivation is at present estimated at only about one-eighth of Canada's total area, or around three hundred million acres. This amount, however, is so great as to provide abundance of farm lands for millions of new population and to make agriculture always the nation's chief factor of wealth. During last year



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the value of the field crops was four times the combined value of the raw products of the mines, forests and fisheries, yet only one-sixth of these three hundred million acres are under cultivation. With more intensive cultivation the area now being utilized would alone support a much larger population. Canada has a rural population of probably four and one-half millions, including those engaged in mining, fishing, lumbering and other activities. This means that every man, woman and child can draw on over sixty acres of land for subsistence. In Northern Europe the rural population with far less widespread occupation is attending to three acres per head.

The estimated area of three hundred million acres suitable for agricultural purposes may be greatly extended as conditions change and land now considered unfit for general farming may yet be found suited for the production of food. For instance, the large area of northwest Manitoba and the Northwest Territories now forms the feeding grounds for vast herds of caribou and musk ox. The introduction of reindeer may also serve to make this inhospitable area of great value in the matter of food production.

## UNOCCUPIED AND UNCULTIVATED LANDS

Her vast areas of agricultural land make Canada one of the richest countries in the world in the matter of natural resources, but lacking development a great part of this wealth is practically non-existent. One of the chief economic questions needing emphasis is the useful occupation of our idle lands and the conversion of this natural resource into form for human use.

In this connection a great deal of basic work has been done by the department through investigations as to the location, extent and ownership of privately-owned lands that are lying unoccupied and uncultivated owing to the non-residence of the owners. These investigations showed that tens of millions of acres of land, particularly in Western Canada, were lying idle within easy distance of the railways, which, if put to proper use, would to a large extent effect a remedy of the railway situation and other national problems.

In view of the advisability of extending settlement on the vacant areas not too far removed from transportation facilities, certain particulars of practical use, such as area, character of soil, distance from markets, prices, terms, etc., have been obtained and the information issued in booklet form for general use with the object of enabling the prospective purchaser to select land suitable to his means and requirements. This information is also being co-ordinated with other data relative to land development such as climate, precipitation, transportation, market and communal facilities and other factors that determine the economic suitability of land for agricultural purposes.



STATEMENT of Land Sales by Railway Companies having

Year	Hudson's Bay Company		Canadian Pacific Railway Company		Manitoba South-western Colonization Railway Company		Qu'Appelle, Long Lake and Saskatchewan Railroad and Steamerboat Company	
	Acres	Amount	Acres	Amount	Acres	Amount	Acres	Amount
		\$		\$		\$		\$
1893			93,184	295,288	14,164	57,559	1,603	
1894	7,526	48,225	43,155	131,628	6,312	280,093	640	
1895	4,451	23,209	55,453	176,950	5,623	22,330	2,391	
1896	9,299	52,410	66,624	220,360	21,254	88,568	286	
1897	10,784	53,277	135,681	431,095	63,800	634,644	2,524	
1898	62,000	310,000	242,135	757,792	106,473	363,982	22,534	
1899	56,845	244,625	261,832	814,857	58,019	199,558	61,030	178,517
1900	40,196	352,631	349,091	1,152,836	133,501	437,449	18,932	53,974
1901	82,308	399,804	339,985	1,046,665	59,749	214,953	22,260	74,810
1902	269,577	1,412,332	1,362,478	4,440,500	206,411	713,365	49,845	147,365
1903	330,019	1,939,804	2,260,722	8,472,250	250,372	699,210	843,900	1,476,900
1904	144,857	879,910	857,474	3,516,864	29,522	113,303		
1905	139,721	865,905	411,451	2,045,800	80,342	296,936		
1906	236,191	1,863,375	1,012,322	6,015,060	83,418	360,889		
1907 (9 months to March 31)	69,158	742,221	851,687	4,817,682	3,051	22,645	1,353	16,789
1908	21,184	267,215	81,080	727,367	31,982	153,097	5,621	68,869
1909	25,449	288,836	29,331	33,340	10,396	84,845	37,632	380,371
1910	104,382	1,297,454	655,585	10,473,425	14,501	126,950	106,000	964,600
1911	267,008	3,747,768	715,095	10,572,661	20,313	284,859	113,533	1,237,204
1912	42,554	808,943	855,280	12,420,488	18,932	117,497	35,213	495,113
1913	53,581	1,128,806	447,158	6,348,352	2,768	48,639	15,395	255,399
1914	26,292	572,837	263,962	4,242,089	7,626	91,948	1,629	21,546
1915	16,400	306,550	151,262	2,495,872	489	5,508	1,292	19,118
1916	79,310	1,273,144	242,215	3,670,421	4,780	58,808	12,246	180,361
1917	254,941	4,234,244	405,764	6,612,040	12,470	165,245	21,533	331,596
1918	386,394	6,914,947	545,285	11,044,887	25,933	321,005	49,723	783,062
1919	285,561	4,978,950	602,555	10,580,669	5,289	67,214	33,838	527,670
1920	276,629	4,724,941	571,571	11,356,146	4,623	53,760	32,095	474,895
1921	178,301	3,037,369	275,636	5,898,994	1,518	20,058	11,432	169,472
Total	3,510,985	42,799,732	14,214,429	130,963,374	1,283,637	5,455,637	1,494,506	7,848,634



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## Government Land Grants, and by the Hudson's Bay Company.

Calgary and Edmonton Railway Company		Canadian Northern Railway Company		Great Northwest Central Railway Company		Total		Average per acre
Acres	Amount	Acres	Amount	Acres	Amount	Acres	Amount	
	\$		\$		\$		\$	s c
11,260						120,211	352,847	2 93
11,035						68,668	207,856	3 02
16,815						114,713	222,489	1 94
10,553						108,016	361,338	3 34
9,436						222,225	719,016	3 23
15,481						448,623	1,431,774	3 18
24,738	53,335					462,494	1,520,792	3 28
46,653	128,256					648,379	2,125,146	3 27
116,719	352,037					621,027	2,088,269	3 36
323,494	1,033,396					2,201,795	7,746,958	3 56
231,800	909,600	183,736	631,505	128,435	522,490	4,229,011	14,651,757	3 46
129,007	563,507	64,469	313,575	41,858	177,081	1,267,187	5,564,240	4 39
109,191	512,898	231,707	1,221,469	17,593	103,561	990,005	5,046,572	5 09
85,784	480,063	204,966	1,014,351	20,003	137,503	1,642,684	9,871,241	6 01
59,515	346,061	289,576	1,711,109	4,023	41,470	1,237,759	7,697,930	6 02
8,606	75,644	196,916	1,746,591	1,294	13,855	346,693	3,052,461	8 80
6,370	66,508			165	7,935	109,373	2,211,885	11 08
18,323	182,926	285,428	2,783,010	571	6,863	1,184,790	15,835,228	13 36
11,820	116,231	277,414	3,336,797	1,438	27,417	1,406,651	19,122,937	13 59
10,853	154,424	365,926	4,216,578	631	11,373	1,329,390	18,224,419	13 70
4,155	44,212	182,491	2,009,642	1,601	32,105	707,149	9,867,155	13 95
19,575	460,129	182,491	2,009,642			501,575	7,398,191	14 75
23,011	444,018			316	6,956	192,801	3,279,031	17 01
11,689	172,033			4,646	81,182	354,886	5,435,949	15 32
33,821	573,875	17,796	298,938	8,829	141,439	755,154	12,357,377	16 35
53,335	815,628	39,546	732,351	16,021	275,724	1,116,237	20,887,600	18 71
31,774	479,496	65,110	1,261,963	14,530	252,774	1,038,657	18,148,736	17 47
26,957	425,656	86,305	1,685,241	27,981	464,586	1,026,157	19,188,225	18 69
11,681	191,928	69,934	1,455,319	5,128	96,616	553,630	10,860,756	19 61
1,503,478	8,581,864	2,743,841	26,427,992	295,064	2,400,942	25,045,940	224,478,175	8 96



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DETAILED STATEMENT of Surveyed Areas in Manitoba, Saskatchewan and Alberta,  
January 1, 1921.

	Manitoba	Saskatchewan	Alberta	Total
	acres	acres	acres	acres
Area under Homestead (including Military Homesteads) . . . . .	8,367,000	27,478,600	18,268,300	54,113,900
Area under Pre-emption and Pur. Hds. (1st Sept., 1908, to 20th Mar., 1918).....		5,518,200	2,664,300	8,182,500
Area under half-breed scrip, sales, special grants, etc.....	5,094,700	2,316,800	1,240,800	8,652,300
Area granted to railway companies.....	3,566,997	15,177,063	13,120,014	31,864,074
Area granted to Hudson's Bay Company..	1,196,700	3,183,200	2,175,600	6,555,500
Area of School land endowment (1-18 of area surveyed in sections).....	1,630,600	3,941,900	3,751,600	9,324,100
Area sold under irrigation system.....		76,842	980,850	1,057,692
*Area under timber licenses.....	909,800	1,071,000	1,304,000	3,284,800
*Area under grazing leases .....	140,600	3,021,600	2,908,200	6,070,400
*Area of forest reserves and parks....	2,386,700	5,953,700	16,754,000	25,094,400
*Area reserved for forestry purposes (inside surveyed tract).....	746,300	1,430,000	1,677,500	3,853,800
*Area of road allowances.....	974,700	1,467,400	1,285,900	3,728,000
Area of parish and river lots.....	505,211	84,010	118,564	707,785
Area of Indian reserves..	433,860	1,070,949	1,376,974	2,881,783
Area of Indian reserves surrendered.....	87,560	410,297	302,228	800,085
*Area of water-covered lands (inside surveyed tract) .....	4,255,500	1,911,100	2,301,700	8,468,300
Area now available for entry.....	5,275,900	4,912,900	15,461,000	25,649,800
Total surveyed area. . . . .	35,572,128	79,025,551	85,682,530	200,280,209

\* Area not available for cultivation.



THE LAND SITUATION, Manitoba, Saskatchewan and Alberta, corrected to January 1, 1921.

Province	Surveyed area in acres			Unsurveyed Area in acres			Total Area in acres		
	Land	Water	Total	Land	Water	Total	Land	Water	Total
Manitoba	31,316,628	4,255,500	35,572,128	112,254,070	13,546,100	125,600,170	143,570,698	17,601,600	161,172,298
Saskatchewan	77,114,451	1,911,100	79,025,551	75,225,869	6,836,580	82,062,449	152,340,320	8,747,680	161,088,000
Alberta	83,380,830	2,301,700	85,682,530	75,497,830	2,202,040	77,699,870	158,878,660	4,503,740	163,382,400
Totals	191,811,909	8,468,300	200,280,209	262,977,769	22,584,720	285,562,489	454,789,678	30,853,020	485,642,698

A large proportion of the unsurveyed area has not yet been explored, except in a very partial way, and the area suitable for agriculture cannot be estimated with any degree of accuracy.



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## RECLAMATION

## IRRIGATION

In 1920 the semi-arid belt of Alberta and Saskatchewan experienced the fourth successive dry year. Before 1917 there were a number of comparatively wet years and irrigation had few supporters in the west; in fact there were many who believed that settlement in the Prairie Provinces was being retarded by those who advocated irrigation as a necessity in the semi-arid tract. The period of dry years caused a strong reversal of opinion in favour of irrigation, which has already been responsible for the enactment of improved provincial irrigation district laws and the erection under these of irrigation districts embodying a considerable area. Two of these districts, the Lethbridge Northern and the United and Lone Rock, are expected to commence construction early in 1921, and others are rapidly reaching the construction stage.

Men who had made a careful study of the semi-arid region, realizing that except in abnormal years the precipitation of the district would be insufficient for crops, predicted many years ago the irrigation development which is now taking place. Officials of the department were among the first to realize the possibilities of irrigation and in accordance with a far-sighted policy they organized and completed, well in advance of the demand for development, extensive surveys of irrigable tracts.

Hand in hand with the survey of the land has gone, since 1909, the systematic and periodic measurement of rivers, creeks and springs, until now sufficient data have been secured to enable the department to determine how much water is available and to dispose of it in the most economical manner. With this latter end in view, an amendment to the Irrigation Act, effective from September 1, 1919, was passed, empowering the Governor in Council to reserve unappropriated water and to allocate it among the applicants as he may deem best in the public interest. Under the authority of this amendment the unappropriated waters of the St. Mary, Milk, Belly, Oldman, and Waterton rivers and their tributaries are now reserved pending the completion of surveys, from which it will be possible to ascertain what are the largest areas which can be most economically served by these streams.

Still with the idea of conserving the limited water supply, departmental experts have, for several years, been conducting investigations at experimental stations at Brooks and Ronalane, Alberta, having as their object the approximate determination of the amount of water required by various crops to produce the best results.

Having practically completed surveys in the more southerly parts of Alberta and Saskatchewan, where irrigation is most needed and most insistently demanded, the department is now turning its attention to more northerly areas where, although irrigation does not seem to be an absolute necessity in most years, its practice would make more intensive farming possible and cause greater and more valuable yields to be produced, particularly in the region to the northeast of the Canadian Pacific Railway Company's Irrigation Block. The need for irrigation, while really considerable, has not yet caused a strong sentiment in its favour to be created. The department, however, in accordance with past policy, which has proved to be sound, is planning next year to make extensive surveys to determine the feasibility and desirability of irrigating these areas.

## HYDROMETRIC SURVEYS

In order that all of the hydrometric survey work of the department might be done by one branch the responsibility for stream measurements in Alberta and Saskatchewan, which formerly belonged to the Reclamation Service, was transferred to the Dominion Water Power Branch.



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## WATER SUPPLY INVESTIGATIONS

Very little progress was made with investigations of domestic and stock-watering supplies on account of the pressure of other more important work. Inspection of these supplies were made when the duties of engineers brought them in the vicinity.

## DRAINAGE

Following the organization of the Drainage Division of the Reclamation Service in February, 1919, a few parties were sent into the field that year and considerable preliminary work was done. It was not, however, until 1920, when the staff of engineers had been considerably augmented and an extensive programme of work had been planned, that drainage surveys and investigations got fully under way. The field-work in 1920 was commenced in the middle of May and was continued well into December. In some respects the season was very favourable for drainage investigations as, on account of the series of dry years, considerable areas were accessible which, in ordinary years, would have been too wet to reach.

One hundred and twenty-seven applications for small private drainage projects were received during the year, of which fifty-five, having reached the stage where investigation was required, were inspected. Six of these projects were found to be infeasible and four were voluntarily abandoned.

About twenty-five of these small projects, which are being dealt with under the provisions of Part I of the Drainage Regulations, have been authorized and are now under construction. As the procedure under the new drainage regulations becomes more widely known it is expected that an increasing number of small owners who wish to reclaim their own or adjacent vacant land will avail themselves of the privileges which they offer, and that much benefit will in time accrue to whole districts whose development is at present retarded by periodic floods.

For the convenience of applicants, departmental engineers make surveys and prepare plans of these small projects, for which the bare cost is charged against them. At the same time other engineers with bigger parties make comprehensive surveys of large flooded areas where most of the land which is likely to be benefited by drainage is still vested in the Crown. Several such projects have been thoroughly investigated; one, the Waterhen Lake project, is now being constructed under a contract let by the department, and three or four others, having been found to be desirable, have been strongly recommended for construction in the near future. A number of projects have been found to be too costly, while investigation has shown others to be infeasible.

Reconnaissance surveys of each project are first made and if the engineer's report is favourable intensive surveys are made the following season with a view to determining the probable cost of the project and the advantages to be derived as a result of drainage. In these surveys every factor bearing upon the question is given very careful consideration and only those projects are recommended which are demonstrated to be eminently suitable for governmental enterprise. There is so much Crown land which needs drainage that it is incumbent upon the department to give first consideration to those areas which are likely to be soonest settled and which can be most economically drained.

## INTERNATIONAL WATERWAYS TREATY

The flow of the St. Mary and Milk rivers was apportioned during the year, as in 1919, under the provisions of an interim order made by the International Joint Commission.



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## MINING

During the year prospecting and mining operations in the western provinces and territories have shown very pronounced activity. In northern Manitoba the mining industry has now become firmly established and shipments of ore in quantity are being made to the western smelters. The silver-lead ore deposits in the Mayo District, in the Yukon Territory, are attracting very general attention, and a number of mines are being rapidly developed. Some three thousand (3,000) tons of high-grade ore, taken from one of the Keno Hill mines, have been made ready for shipment by water with the opening of navigation. This ore is hauled a distance of about forty-five miles to the Stewart river, and taken down the Stewart and Yukon rivers to tide-water, thence by ocean steamer to the smelter, a distance of about five thousand miles, involving at least five transshipments. Only very high-grade ore could stand so high an initial charge.

## OIL

Active boring operations for the discovery of oil are being continued in Alberta, Saskatchewan, British Columbia, and the Northwest Territories. Wells are being drilled in Viking, Czar, Monitor, Willow Creek, Pincher, Pitt Meadows, Windy Point, and other fields.

In the autumn of 1920 discovery was reported to have been made by the Northwest Company of oil in quantity about forty-five miles north of Fort Norman, and an inspection of this discovery will be made during the summer.

A staff of technical officers has been established at Calgary, with all necessary appliances, to close wells which the operator is unable to control, to supervise drilling operations, to furnish technical advice, and to insure the conservation of the natural resources of the western provinces and territories.

## COAL

In the province of Alberta 269 coal mines are in active operation, with a production amounting to almost 7,000,000 tons, the increase being largely due to the extension of the market for high-grade coal to Saskatchewan and Manitoba. The fields which are now in active operation include Estevan, Crowsnest, Drumheller, Carbon, Brazeau, and Yellowhead. In the province of Saskatchewan seventy-two coal mines are being operated.

## THE DOMINION PARKS

Travel to the Dominion Parks continue to show a steady increase, last year's being the heaviest yet recorded. The total number of visitors approximated 150,000, of whom one-third were from foreign countries. This increase was not confined only to the great resorts like Banff and Lake Louise, which were crowded to capacity for practically all the season, but extended to smaller and less widely known parks as well. Waterton Lakes park in southern Alberta, which can be reached only by a long motor drive, had nearly 14,000 visitors, or 5,000 more than during the previous year.

Following the policy laid down in previous years development work in the parks was concentrated on road construction. The Castle-Lake Louise road, an extension from the Banff-Windermere highway, which will open up the beautiful Lake Louise and Moraine lake districts to eastern motorists, was completed at the close of the season and will be thrown open for travel early during the season of 1921. The distance from Calgary to Lake Louise is approximately 110 miles and owing to the easy grades the trip can be made in about seven hours, so that a large motor travel from the prairies may confidently be looked for in the immediate future.



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Work was also continued on the Vermilion-Sinclair division of the Banff-Windermere highway. About eight miles of new road were completed and twenty-one miles of clearing. Work on this section is very heavy owing to the extensive rock cutting involved. Much of it is solid rock excavation with cuts ranging from twenty to sixty feet. The long distance from the base of supplies combined with the labour stringency have also added to the difficulties of the work, but considering the conditions, good progress has been made. About fifteen miles of clearing and 42 miles of grading remain to be completed, but with favourable conditions it is hoped the road may be ready for traffic by the close of the season of 1922. Its importance as a scenic highway can scarcely be overestimated. It will provide a direct route from Banff to Spokane, Vancouver and California, and make possible a motor journey of several hundred miles through the heart of the Canadian Rockies, a trip which can scarcely be paralleled for scenic magnificence.

The number of buffalo in the Government herds now totals 5,393 -5,152 of which are in Buffalo park, Wainwright, 230 at Elk Island park, Lamont, and 11 at Banff. The proportion between the sexes is about even, which means that there are about 1,000 more males in the herd than are required to keep it in good condition. It has therefore been decided to slaughter about that number of buffalo during the coming winter when the animals are in prime condition and to dispose of the meat, heads and hides, from the sale of which it is expected a considerable revenue will be obtained.

The very dry season was the cause for much anxiety on account of the danger of forest fires, but although a number of fires started in the parks, owing to the vigilance of the warden service and the improved equipment with which all the parks are now provided, it was possible to extinguish nearly all of them before any serious damage had been done. A new portable fire unit of a larger and heavier design was developed for fire fighting work and sent to Banff. The engine, which is mounted on a three-quarter-ton Reo chassis, is capable of delivering 130 gallons per minute at 120-pounds pressure and it is believed it will prove of very great assistance in the work of fighting forest fires which occur within reach of the various motor roads.

The application of the Dominion Parks Game Regulations to Yoho and Glacier parks following the terms of the agreement recently entered into with the province of British Columbia, has had a very beneficial effect upon wild life. The superintendent reports there is already a noticeable increase in game of all kinds, not only due to the prohibition of shooting but apparently because the wild life appears to have discovered for itself that within these areas it is free from molestation and so is coming into the parks from the surrounding districts. A satisfactory, steady increase is also reported from the other parks where sanctuary conditions have been in force for some years.

Good progress has been made with the work of the preservation of the historic sites of national importance. In view of the large field to be covered and the great number of places of historic interest throughout Canada, it was recognized that before undertaking any extensive preservation or marking, a Dominion-wide historical survey was necessary to collect information with regard to all existing sites and to decide which of these were of national importance. This survey has been carried on during the year by the members of the Historic Sites and Monuments Board, each of whom is a specialist in his own division of Canadian history. The co-operation of thirty-four historical societies and associations interested in the preservation of Dominion landmarks has also been secured. To date 517 sites have received the attention of the board and 46 have been selected to receive attention.

It is very gratifying to note that the enforcement of the Migratory Birds Convention Act has already resulted in a marked increase in many valuable forms of bird life. This has been especially noticeable among the waterfowl, which have shown a notable increase in numbers throughout all Canada. In portions of British Columbia



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during the past fall the shooting was better than at any time for years past; the number of breeding birds on the western prairies, where so many of the waterfowl of the continent are raised, has shown definite increase; and in the Maritime Provinces this spring there was a notable increase in the numbers of ducks and geese going north on migration. Several important amendments were made to the regulations during the year, notably the provision with regard to bag limits and equipment which may be used in taking migratory birds. The organization for the enforcement of the Act was also further developed and a very large amount of educational work was done. In June, 1920, seven bird sanctuaries in Alberta were created by Order in Council and regulations established for their control. The final completion of the Saskatchewan sanctuaries is pending and a survey to locate suitable sanctuary areas will be undertaken in Manitoba during the coming summer.

Under the Northwest Game Act, which is administered by the Dominion Parks Branch, approximately 300 licenses for hunting, trading and trafficking were issued from which a revenue of \$3,176 was obtained. Furs taken under these licenses were valued at \$661,446. In view of the anticipated rush to the Mackenzie river oil fields special protective measures have been taken to protect the game resources of this region and to ensure the enforcement of the law.

The reindeer herd at Old Fort, Quebec, the only domesticated herd in the Dominion, which was formerly under the control of the Department of Indian Affairs, was transferred to the Department of the Interior and placed under the administration of the Parks Branch. It is expected that the experience gained in administering the reindeer in the Canadian Labrador will be of great benefit in connection with the larger question of the domestication of caribou and the development of the reindeer industry in the far north of Canada, a question which is now receiving the consideration of the Government.

#### FORESTRY

The fiscal year 1920-21 was a period of readjustment following the war and post-war periods, and the process of this readjustment was reflected in the conditions prevailing in connection with the administration of forest reserves and forest resources. The prices of farm products declined, while labour remained scarce and wages high. This affected the forest reserves administration directly, since it reduced the amount of building on farms and, consequently, lessened the demand for building timber. On the other hand, owing to the disposition of many settlers to get out their own fuel in the form of wood, the demand for fuel-wood increased considerably over the preceding year. Mine timber was also in increased demand. The number of stock grazed on forest reserves decreased slightly, owing to pasturage and market conditions, but the number of farmers and stock-raisers pasturing herds on the reserves increased, showing that the benefits of the system are steadily becoming more widely distributed. The number of stock associations, which work in co-operation with the Forestry Branch, has also increased, and these associations, in addition to assisting in range management, are also raising the standard of the stock pastured on the reserves. The demand for seedling trees to plant shelter-belts on prairie farms was, in spite of labour shortage, about the same as in the preceding year, and there are indications that with the return to more normal conditions there will be a great expansion in tree planting. Notwithstanding the unsettled agricultural and industrial conditions prevailing during the year, the revenue of the Forestry Branch increased to \$143,812, which was an increase of nearly \$16,000 over the preceding year.

From the standpoint of the prevention and suppression of forest fires the year was much nearer a normal one than its predecessor. There was ample precipitation in early spring to keep down fires, and, while the fire-hazard became high in late mid-summer, especially in Manitoba and British Columbia, the damage was much less than in the previous year; more fires started, but the percentage of these that got



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beyond the incipient stages and became large was much smaller. Airplanes were used for the first time in forest protective work in Western Canada and, though the period of testing was short, the results indicated that the airplane will prove an effective aid in forestry work.

A total of about twenty acres on various forest reserves was planted with Scotch pine, jack pine, and white spruce seedlings, and approximately twenty-five acres were sown with tree seed; the species being white spruce and jack pine in about equal proportions. This experimental planting and seeding not only restores or increases the supply of desirable species on forest reserves but also gives valuable data as to rate of growth, and as to the best methods of doing the work.

The work of the forest experimental station at Petawawa, Ont., was continued and extended. This station, situated in the heart of the old pine area of Ontario and Quebec, is engaged in investigating the best methods of securing reproduction of desirable species of timber on non-agricultural lands that have been cut over and burned over since the Ottawa valley was opened. Experimental plots enclosing trees of the various species, both in pure stands and in mixture, have been marked out and the rate of growth under different conditions of thinning, trimming, drainage, etc., is being watched and recorded. The work has already yielded a large amount of valuable information, which will be greatly increased in the next few years.

The Forest Products Laboratories of Canada continued the study of the mechanical and physical properties of all Canadian timbers. The results of this investigation as it proceeds enable manufacturers and builders to put each wood studied to its best use; and it also shows profitable new uses for woods hitherto deemed to have but a small range of utility. Special investigations were conducted in regard to paper, pulp, pulpwood, mine timbers, factory timbers, railway ties, etc., and many questions submitted by manufacturers of forest products answered.

The increased interest which the statesmen of the British Empire are taking in forestry was shown in many ways during the year. There was the holding in London, in July, 1920, of the Empire Timber Exhibition and the Empire Forestry Conference, at each of which Canada was well represented. Both of these promise important developments looking towards Canada. The British Forestry Commission continues to draw large quantities of tree seed from Canada for reforestation purposes, which seed is collected and shipped by the Forestry Branch.

## WATER-POWER

The general survey of the water-power situation throughout the Dominion carried on by the Dominion Water Power Branch indicates that there is now a total installation of 2,470,000 horse-power in Canada and that during the fiscal year just ended there has been not only a substantial increase in the power available, but remarkable progress in hydro-electric development operations which will largely increase the power output in the immediate future. Much of this increase is due to extensions to existing plants.

The tendency throughout the Dominion has been towards consolidation where feasible of systems serving the same market. Quite recently the British Columbia Electric Railway Company absorbed the power developments of the Western Power Company of Canada on the Stave river, the merger of the developments serving central western Ontario has practically been consummated, while the various developments serving the Montreal market are now largely consolidated.

Several new developments initiated during the previous year have made distinct and satisfactory progress. Especially is this so in the provinces of Nova Scotia and New Brunswick, where Provincial Government power commissions have undertaken important developments to meet provincial needs. A remarkable and in many ways



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unique power scheme, the Queenston-Chippawa project of the Ontario Hydro-Electric Power Commission at Niagara Falls, is rapidly reaching the operating stage. Here individual units of 55,000 horse-power capacity, the largest hitherto attempted, are now being installed; these represent the very latest progress in both hydraulic and electric engineering science.

During the year most satisfactory and substantial progress was made towards completing the Water Resources Index-Inventory of the branch. By means of this inventory Government officials, Dominion or provincial, and the members of the general public concerned in any way with power development, can be placed in immediate touch with any data regarding water-power development and water resources generally anywhere in the Dominion.

The Hydrometric Survey of Canada was instituted by Order in Council of July 19, 1920. As a result there has now been established practically from the Atlantic to the Pacific a uniform scheme of basic water resources investigatory effort, which has been worked out through the constructive collaboration of the various Dominion and provincial organizations concerned with power and cognate questions.

So far as the Prairie Provinces are concerned, certain specific matters of importance have been concluded. The question of the regulation and control of the upper waters of the Winnipeg river is about to be definitely settled by agreement between the three Governments concerned—the Dominion and the provinces of Ontario and Manitoba. By the purchase of certain lands dominating power sites on the Winnipeg river, the department now has practically complete control over a water-power situation which is probably unique on the continent, namely, that of the Winnipeg river, where there is over 500,000 dependable twenty-four-hour horse-power within seventy-five miles of the city of Winnipeg.

Regulations covering the conjoint development of two of the most important resources in the Prairie Provinces—water-power and pulp timber—have been completed and promulgated. It is fully expected that under these regulations there will shortly be commenced a pulp and paper project which will meet the growing needs for newsprint for the Prairie Provinces.

In general, the year has been one of distinct progress. While no new development has actually commenced within the administrative jurisdiction of the department, this lull has been fortunate in that it has afforded us ample opportunity to gather much essential basic water resource and allied data necessary to prove the economic feasibility or otherwise of many projects which have been vigorously presented for definite action. There has also been opportunity for substantial and unhurried progress in the drafting of new water-power regulations; these are now practically complete.

Modern civilization cannot exist without motive power. Coal placed civilization where it is and there is every indication that coal can, for the present, carry it no further. Even now, when there is a general and pronounced industrial depression, there is a fuel emergency; whether this will prevent an industrial revival or bring about a crisis when the industrial revival becomes well started, only the future can reveal.

It has been stated that the biggest question in the world today is the combined one of fuel and power, and water-power is universally acknowledged as the only possible solution; it alone can relieve the fuel situation and bear the burden of increased industrial effort until the fuel problem is solved and the fuel industry rehabilitated. France, Spain, Italy, Norway, Sweden, Germany, Japan, the United States, are all bending their efforts to investigate and utilize their resources. England, whose water-power resources are small in relation to her requirements, is tending towards the development of tidal power. If the development of water-power is as vital to progress as authorities state it to be, Canada can claim to be amply prepared to take her place in the van.



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## DOMINION OBSERVATORY, OTTAWA

Work with the meridian circle was prosecuted on the same programme as in recent years; observations were obtained on 137 nights, a somewhat greater number than the average; the computations are making satisfactory headway, though still in arrears. The division errors of the single degree marks of the two graduated circles have been measured, a proceeding which is necessary before the final computations can be made; this involved about 21,000 microscope pointings, which alone, apart from the computations involved, entailed about 400 hours of observing time. Special investigation of certain of the intermediate divisions remain to be made during the coming summer.

Field observations for latitude and longitude were carried out at five stations in British Columbia, at the request of the Provincial Government. The longitudes were determined directly from Ottawa by electric telegraph; the latitudes in the usual way by Talcott's method. A revision is now being made, and is nearly completed, of all such field observations which have been carried out by the observatory; this will be published in the near future.

The time service has been maintained as in previous years, and has been extended to the Hunter building. Some assistance has been given in the installation of clocks in the new Parliament buildings; pending the final completion of the installation this system is still in the contractor's hands. Ten secondary master-clocks are synchronized continuously from the observatory; these in turn control about 400 clocks and dials of various kinds, including the tower-clocks at the observatory and the city post office. Relays beating seconds are maintained in three offices in the city, one clock is synchronized every hour, time signals are sent out by telegraph and telephone, and the time is recorded on the various seismographs at the observatory.

A comparison is made daily with Washington time by means of the wireless time signals sent out by Annapolis or Arlington; comparisons have also occasionally been made with other American and European stations. Some of these signals have been recorded on the chronograph for a portion of the year, and considerable experimental work has been carried on with reference to the possibility of systematic errors in chronographic registration of such signals.

The large equatorial telescope was utilized as heretofore for obtaining radial velocities of stars, a total of 505 spectrograms having been taken with an average exposure of one hour each. Also 148 direct photographs with an average exposure of three hours each have been taken with the wide angle camera, which was mounted on the telescope. Class B stars have been studied as well as stars of classes F, G and K.  $\delta$  Scorpii,  $\delta$  Eridani and  $\beta$  Cephei have been studied in detail and have proved to be most interesting systems. Nova Cygni No. 3 was investigated both spectroscopically and by photographic photometry. A paper entitled "A Spectrographic Study of Early Class B Stars, First Paper," has been published as one of the Dominion Observatory Publications. A second paper on the subject is in press.

Several articles on the stationary calcium lines, the interstellar clouds of metallic gases and Nova Cygni No. 3 have been published in the *Journal of the Royal Astronomical Society of Canada*.

The equatorial was available to the public on Saturday nights, 1,124 persons having registered, to which must be added many who failed to register.

With the coelostat and solar spectrograph 270 plates comprising 1,300 observations recording over 12,500 strips of solar, iodine and electric arc spectra, were secured. In addition some 20 test spectra and attempts to photograph the spectrum of Venus on a large scale were made. The Venus spectra were not found sufficiently strong for measurement. Also, 109 photographs of the sun were taken with the coelostat and equatorial solar cameras to record sun-spots. Measurements of rotation, wave-lengths, and convection and pressure in sun-spots were carried on. Eight



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papers were presented to the American Astronomical Society, the results of one of which may be specially mentioned, namely, the determination of the sun's distance from the pulse of its wave-lengths due to the elliptic motion of the earth (a method proposed here) resulting in a preliminary value two parts in a thousand in excess of the accepted value, and promising much for future measures.

With the photographic equatorial telescope the use of extra-focal method has been continued owing to unavoidable delay in constructing the thermopile equipment. One hundred and twelve plates with over two hundred exposures have been taken. These include the Harvard Polar Sequence field, the variable RT Aurigae and Reid's Comet. The Polar Sequence plates have been reduced and are being prepared for publication along with measures of other standard fields.

The operations of the magnetic survey during the past season were carried along lines followed during previous years. The field work was confined for the most part to observing the three elements, declination, dip and horizontal intensity, at "repeat" stations. In addition to the series of stations occupied along the north shore of the St. Lawrence river between Quebec and Blanc Sablon and a few in Nova Scotia and New Brunswick, a number in the southeastern part of Ontario were occupied.

There will issue shortly the reduction of 500 magnetic stations in Canada, extending from Blanc Sablon to Prince Rupert, all reduced to a uniform epoch 1921, giving tabular values for the three magnetic elements declination, inclination and intensity, as well as four sheets of maps covering the whole of Canada, showing the declination graphically at each of the 500 magnetic stations.

The seismological instruments of the observatory registered 115 earthquakes as compared with 96 during the last fiscal year. The seismographs at Halifax and Saskatoon and the undagraph at Chebucto Head, N.S., being instruments of the observatory, continue to function satisfactorily. Monthly bulletins have been issued regularly and are being sent each month to 118 stations scattered over the earth. The deformation instrument is now recording again after being inactive due to repairs to the vaults. The temperature control of the vertical seismograph has been perfected, resulting in continuous uninterrupted records from that instrument.

#### DOMINION ASTROPHYSICAL OBSERVATORY, VICTORIA, B.C., J. S. PLASKETT

This is the third annual report upon the work of this observatory in which actual observational work was commenced on May 6, 1918. The details of the work are presented in complete form in the publications of the Dominion Astrophysical Observatory, of which 20 numbers have now been issued and distributed, and it will only be necessary here to present a brief summary of what has been accomplished.

The observing weather during the past year has been much less favourable than in the two previous years, although this perhaps does not appear from the comparative records. The spring and summer months were very good but the fall and winter unusually cloudy and wet and although observations were obtained on a greater number of nights than in 1919-20, the spectra secured were twenty per cent fewer in number. In the year April 1, 1920, to March 31, 1921, 1817 star spectra, between the numbers 4002 and 5828 (the missing 10 being due to error in numbering), were obtained on 215 nights. On 18 additional nights the dome was opened and observation started, but, owing to clouds or other bad conditions, no measurable star spectrum was obtained. On 26 of the 215 nights only one spectrum was secured and on less than 150 nights was the sky continuously clear throughout. Two clear nights, while the mirror was being resilvered, could not be used and another night was lost due to an accident to the dome. Otherwise, however, it may be safely stated that the telescope was engaged in actual observations on every usable night, including Sundays and holidays.



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The principal work of the observatory during the past year has been, as hitherto, the continuation of the main programme of radial velocity measures. This programme contains some 770 stars selected from those north of the equator in Boss's Preliminary General Catalogue which had not been previously observed. The magnitudes of these stars range between about 5.5 and 8.0 and observations have been secured of about 720 of them, the observation of the remaining 50 of about the eighth magnitude or fainter having been postponed for lower dispersion. The observation, measurement and reduction of about six spectra each of these 720 stars is now nearly completed and the results are being prepared for publication. All the spectra have been obtained with one-prism dispersion, the linear scale, since August, 1919, being 29A to the millimetre at H. In order to obtain reliable velocities with this small dispersion the number of spectra proposed to be obtained of each star was placed at six. This ideal has been attained with very few exceptions and in some stars with poor lines has been exceeded. The accuracy of the measures is gratifyingly high as the probable error of a single plate of a star with good lines is about one kilometre per second giving the error of the mean of about four-tenths of a kilometre.

In the investigation of the velocities of these 720 stars about 150 have been found to be spectroscopic binaries, leaving about 570 constant velocity stars. When we compare these numbers with those previously determined at all other observatories which, from the beginning of accurate radial velocity work some twenty-five years ago, comprise less than 2,000 radial velocities and some 600 spectroscopic binaries, it will give some idea of the magnitude of the work in this programme, and of the energy with which it has been attacked.

In addition to this main work to which most of the time of the staff has been devoted, a number of independent investigations have been completed and the results published. Taking first those allied to the radial velocity work above described there is the work begun by the director of obtaining the spectroscopic orbits of eclipsing variables whose photometric orbits have been determined. This has been energetically continued and the orbits of U Coronae, TX Hercules, Y Cygni and Z Vulpeculae have been determined, in addition to the three obtained last year. As in each of the four variables observed the spectrum of each component is measurable, the absolute linear dimensions and the distance apart of the two components with their masses and densities have been obtained. This work is important as it gives the only known means of obtaining the absolute dimensions of the stars, and it is proposed to continue it to all eclipsing variables bright enough to be spectroscopically observed. Previous to the work here, the dimensions of only seven systems were known and to these six have been added by this work. Another line of work closely allied to radial velocities is the determination of the orbits of spectroscopic binary stars to which considerable time has been devoted. Mr. Harper has determined the orbits of the binaries Boss 5026, H.R. 6385, Boss 5900 and Boss 5070, all of which were discovered here. The first three have appeared in the observatory publications while the fourth is in press. Dr. Young has determined the orbits of H.R. 8427, H.R. 6169, H.R. 8800 and  $\alpha$  Draconis. The first three binaries were discovered here and have appeared in our publications, while the fourth orbit of a long period binary discovered elsewhere is in press. Professor S. L. Boothroyd, volunteer research assistant at the observatory for the past two summers, has obtained the orbits of two binaries discovered here, Boss 4602 and H.R. 8803. The first has been issued in our publications and the second is in press.

In addition to this direct radial velocity work, Mr. Harper made observations of the Spectrum of Nova Vyni which appeared last summer and these spectra were measured and the results discussed along with further discussion on the Spectrum of Nova Aquilae in Vol. I, No. 24, of the observatory publications which is now in press. Dr. Young has made an extensive investigation and compilation of the behaviour of the H and K lines of Calcium in early type stars, which has appeared



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as Vol. I, No. 17, of the observatory publications. As a result of this investigation certain fundamental facts concerning this interesting problem have been brought out and some general considerations looking towards the explanation of the observed facts adduced.

The time of Mr. H. H. Plaskett, outside of his share of the general radial velocity programme, has been devoted entirely to purely astrophysical problems principally connected with the radiation from the stars and the energy distribution in their spectra. A new method developed by Merton and Nicholson of determining relative intensities in terrestrial spectra has been improved and adapted after considerable experimental difficulty to celestial spectra and promises to give results of the highest interest and value. A preliminary paper on the intensity of the emission lines and continuous spectrum of  $\gamma$  Cassiopeiae was read before the Royal Astronomical Society, London, and this work has been extended to the determination of the energy distribution in typical stellar spectra. Observations are practically completed and the paper which will appear as No. 26 of Vol. I is in preparation.

The remaining two prisms of the spectrograph, whose completion was delayed on account of the impossibility of obtaining material during the war, were finished by the Jno. A. Breashear Co. and delivered last summer. Their performance was carefully tested and they were found to give excellent definition. Owing to the urgency to complete the main programme, in which one-prism dispersion only is used, they have not yet been used in any investigation, but it is proposed shortly to use the spectrograph with two and three prisms in certain special problems. Another addition to the instrumental equipment has been the receipt of the Callendar Recorders for recording and controlling the temperature of the spectrograph and for recording continuously the temperatures of the dome and mirror. These recorders were ordered in 1916, but their construction has been long postponed by war delays and post-war problems so that they were only received last January. They were promptly permanently installed in a very satisfactory manner by Mr. T. T. Hutchison, who assists in the night observing, and have proved to be of great value in maintaining the spectrograph at constant temperature and also in giving a record of the changes of temperature around the mirror in comparison with changes in the dome temperature. Considerable time has been spent by the director in testing the prisms and in experimenting to determine the best position and arrangement of the resistance thermometers of the recorders. The resistance thermometer used in the spectrograph is divided into five equal sections distributed as uniformly and symmetrically as possible over the interior of the spectrograph, thus ensuring much more uniform and homogeneous temperatures than would be otherwise possible.

The performance of the telescope has remained perfectly satisfactory and has, I am convinced, never been equalled for accuracy, convenience, and rapidity of operation. The time required to make the change from star to star, from the end of the exposure on one plate to the beginning of that on the next, is on the average two minutes, which is only exceeded when in passing from a north to a south star or vice versa the dome has to be revolved through about 180 degrees. The driving is practically perfect, and even with the long focal length of 108 feet the star image remains on the slit for several minutes at a time.

The privilege extended to the public of viewing celestial objects through the telescope every Saturday evening between eight and ten o'clock has apparently been much appreciated and is fully taken advantage of with an average attendance of about 200 during the summer months, reduced during the winter to about 50. Numerous applications for the extension of this privilege to other evenings have been received, but this has not been allowed owing to the loss of observing time entailed. The observatory is in addition open to visitors every week day during regular office hours, and visitors are registered here from all over the world. The local authorities have a great pride in the institution and every visitor or party of note coming to Victoria is taken



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to the observatory, thus making the enterprise of the Government in establishing the institution of world-wide knowledge.

The scientific staff of the observatory remains the same as at the last report, and although there is ample work to fully occupy the time of two or three more officers, the present office quarters cannot accommodate them. It is very essential for the progress and efficiency of the work to have the building equipment of the observatory completed. The use of the temporary office quarters on the ground floor of the observatory building is especially undesirable on account of interference with observing conditions, and, moreover, the accommodation is inadequate, poorly heated and ventilated and bad for the health and contentment of the staff. The completion of a moderate-sized office building and of the necessary residences for those having night observing at this relatively inaccessible place is a matter of urgent necessity for the progress of the observatory's work and it is hoped will not be longer delayed.

There have been read at scientific meetings during the year and published in various scientific papers the results of investigations carried on by the staff of the observatory. These investigations have in most cases been issued as Publications of the Dominion Astrophysical Observatory, of which the following numbers have appeared during the year:—

- Vol. I, No. 9—The Orbits of the Spectroscopic Components of Boss 5026, by W. E. Harper.
- No. 10—One Hundred Spectroscopic Binaries, by J. S. Plaskett, W. E. Harper, R. K. Young, H. H. Plaskett.
- No. 11—The Spectroscopic Orbit of U Coronæ, by J. S. Plaskett.
- No. 12—Orbit of the Spectroscopic Binary H.R. 8427, by R. K. Young.
- No. 13—The Orbit of the Spectroscopic Binary H.R. 6385, by W. E. Harper.
- No. 14—The Orbit of the Spectroscopic Binary Boss 5900, by W. E. Harper.
- No. 15—The Spectroscopic Orbit of TX Herculis, by J. S. Plaskett.
- No. 16—The Spectroscopic Orbit of Y Cygni, by J. S. Plaskett.
- No. 17—The Calcium Lines H and K in Early Type Stars, by R. K. Young.
- No. 18—Orbit of the Spectroscopic Binary H.R. 6169, by R. K. Young.
- No. 19—Orbit of the Spectroscopic Binary H.R. 8800, by R. K. Young.
- No. 20—The Orbits of the Spectroscopic Components of Boss 4602, by S. L. Boothroyd.



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STATEMENT of Gross Cash Receipts Received from all Sources, During the Fiscal Year  
 Ended March 31, 1921, Compared with the Receipts for the Previous Fiscal  
 Year.

Source of Revenue	1920-1921	1919-1920	Increase	Decrease	Net Increase
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Dominion Lands .....	4,086,076 49	4,738,840 85		652,764 36	
School Lands.....	4,480,270 67	3,900,091 75	580,178 92		
Ordinance Lands.....	8,887 88	9,840 33		952 45	
Seed grain.....	773,200 67	1,155,354 64		382,153 97	
Casual Revenue.....	811,970 45	22,837 87	789,132 58		
Registration fees, Yukon....	448 31	450 78	17 53		
Fines and forfeitures.....	1,139 75	70 00	1,069 75		
Sales of railway lands, special account.....	27,602 30	75,255 00		47,652 70	
	10,189,596 52	9,902,721 22	1,370,398 78	1,082,523 48	286,875 30



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## STATEMENT of Cash Receipts on Account of Dominion Lands Revenue for the Fiscal Year Ended March 31, 1921, as Compared with the Receipts for the Previous Fiscal Year.

Particulars	1920-1921	1919-1920	Increase	Decrease	Net Decrease
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Homestead fees.....	53,880 00	67,460 00		13,580 00	
Improvements.....	69,732 66	77,807 94		8,075 28	
Pre-emption sales under Act, 1908.....	1,484,277 49	2,415,322 26		931,044 77	
Purchased homestead sales.....	93,571 24	132,738 49		39,167 25	
General sales.....	135,749 20	201,247 33		65,498 13	
Sale fees.....	50 00	120 00		70 00	
Map sales; office fees, etc.....	16,333 67	17,134 19		800 52	
Rental of land.....	12,029 05	15,455 17		3,426 12	
Survey fees.....	31 65	18 68	12 97		
Timber dues.....	705,313 77	589,780 21	115,533 56		
Grazing rental.....	183,756 97	183,661 96	95 01		
Grazing lands improvements.....	760 00	1,105 80		345 80	
Coal lands.....	457,065 08	361,947 48	95,117 60		
Hay permits.....	30,217 62	36,362 19		6,144 57	
Mining fees.....	65,824 73	62,255 08	3,569 65		
Hydraulic leases.....	2,160 00	2,265 00		105 00	
Dredging leases.....	1,443 22	1,958 97		515 75	
Export tax on gold.....	31,126 21	41,463 84		10,337 63	
Free certificates for export of gold.....	1 50	8 00		6 50	
Stone quarries.....	9,842 92	8,717 12	1,125 80		
Rent of water-power.....	3,244 93	3,661 18		416 25	
Sand, stone and gravel.....	2,537 74	541 45	1,996 29		
Petroleum.....	620,872 62	370,482 67	250,389 95		
Potash leases.....	893 80	1,316 37		422 57	
Irrigation fees.....	399 00	540 50		141 50	
Irrigation sales.....	7,573 68	50,297 01		42,723 33	
Fees re Board of Examiners, D. L. S.....	200 00	255 00		55 00	
Patent and interchange fees.....	320 00	220 00	100 00		
Suspense account.....	3,400 79	6,725 88		3,325 09	
Interim receipt account, Yukon Forestry Branch—Sale of trees, etc.....	578 15		578 15		
Fishing permits.....	7,269 12	4,012 55	3,256 57		
Miscellaneous.....	1,660 00	881 00	779 00		
Rocky Mountains Park.....	11,212 29	6,335 46	4,876 83		
Jasper Park.....	60,961 23	48,330 58	12,630 65		
Waterton Lakes park.....	5,473 12	21,227 93		15,754 81	
Yoho park.....	2,896 13	3,848 42		952 29	
Buffalo park.....	1,206 09	828 45	377 64		
Elk Island park.....	124 15	1,949 55		1,825 40	
Glacier park.....	31 50	16 00	15 50		
Moose Mt. Buffalo reserve....	230 82	18 56	212 32		
Antelope park.....	35 60	35 60			
Fort Anne park.....	409 60	409 60			
Point Pelee park.....	38 00	47 00		9 00	
	1,341 15	30 44	1,310 71		
Refunds.....	4,086,076 49	4,738,840 85	491,978 20	1,144,742 56	652,764 36
	130,750 93	116,249 03	14,501 90		14,501 90
	3,955,325 56	4,622,591 82	477,476 30	1,144,742 56	667,266 26

In addition to \$135,749.20 on account of general sales, the department received \$27,602.30 from sales of railway lands, which sum, as provided for by Orders in Council, has been credited to special accounts in the books of the Finance Department.



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Fiscal Year	Homestead Fees	Pre-emption Fees	Improvements	Sales		Map sales, Office and Registration Fees, etc.	Dominion Lands Surveyors' Examination Fees	Rents, Survey Fees, Miscellaneous, including Trust Account	Purchased, Homestead Inspection, Cancellation and Sundry Fees	Timber Dues
				Cash	Scrap					
	\$	cts.	\$	cts.	\$	cts.	\$	cts.	\$	cts.
1872-73	6,960 00		19,170 20							\$ cts.
1873-74	7,310 00		19,834 75					125 50		109 25
1874-75	11,510 00		13,666 90			129 00				2,710 53
1875-76	4,680 00		3,478 94							2,335 25
1876-77	2,250 00		1,085 86			4 00		100 00	40 00	387 00
1877-78	14,540 00		2,794 86				180 00		290 00	320 00
1878-79	17,690 00		4,998 39				310 00	13 70	410 00	1,620 00
1879-80	41,255 00	10,241 43	45,708 97				580 00	183 25		325 00
1880-81	20,450 00	10,801 75	71,170 17			81 00	420 00	37 58	1,780 00	25,121 46
1881-82	54,155 00	39,843 90	1,240,328 27			245 40	890 00	58 10		32,028 34
1882-83	73,015 00	54,725 00	516,092 21			985 40	890 00	501 77		58,753 14
1883-84	41,580 00	28,810 00	424,863 36			3,036 45	530 00	45,766 53	0 45	90,066 46
1884-85	25,645 00	17,100 00	199,275 32			3,109 50	370 00	50,068 54	1,713 00	147,983 10
1885-86	26,110 00	14,371 00	76,140 41			1,289 55	360 00	20,070 00	2,685 00	87,474 99
1886-87	19,614 00	6,887 93	48,175 76			1,621 82	240 00	44,561 00	5,025 40	64,820 31
1887-88	23,691 00	4,830 00	52,238 36			1,329 34	240 00	20,391 41	7,778 53	65,111 74
1888-89	59,460 00	10,550 00	57,513 16			1,660 75	220 00	10,389 57	12,078 50	94,964 55
1889-90	35,920 00	8,580 00	54,896 85			1,410 16	190 00	3,316 23	20,402 50	90,290 00
1890-91	29,164 10		91,664 98			2,099 07	88 00	7,951 05	20,232 50	84,642 95
1891-92	46,994 00		108,901 01			1,854 78	135 00	29,898 49	14,712 50	102,902 71
1892-93	37,689 74		93,641 67			2,147 31	82 00	18,509 35	23,104 00	106,461 35
1893-94	36,462 26		53,254 71			975 20	40 00	13,457 09	22,014 00	105,865 24
1894-95	29,664 88		37,293 71			973 11		6,271 77	11,097 90	81,290 51
1895-96	18,287 00		46,373 98			695 99		6,271 77	6,566 50	74,079 20
1896-97	21,179 00		49,335 53			610 78		21,679 31	6,810 50	61,923 47
1897-98	34,780 00		80,178 64			795 05		19,421 98	8,527 00	68,992 82
1898-99	58,235 00		116,598 35			1,987 40		21,942 66	10,042 50	119,313 78
1899-1900	72,690 00		103,247 58			1,262 05		75,085 95	13,519 00	155,360 03
1900-1901	79,910 00		40,360 93			1,258 85		38,072 54	14,937 00	126,315 82
1901-1902	144,425 00		66,950 21			3,874 14		40,940 51	12,722 00	209,399 32
1902-1903	320,409 65		155,507 59			5,792 96		71,997 30	663 00	207,790 90
1903-1904	255,772 36		196,750 15			5,911 96		125,158 56	595 00	470,916 93
1904-1905	304,806 25		154,128 04			5,549 13		81,550 46	1,081 00	397,344 33
1905-1906	417,834 25		442,588 69			4,879 13		144,924 31	1,265 00	266,951 46
1906-1907 (nine months)	215,449 55		494,117 12			6,042 54		141,948 55	976 25	292,684 53
1907-1908	301,693 73		31,795 19			5,449 06		69,536 31	1,089 51	379,476 32
1908-1909	389,039 00		71,139 47			7,727 29		148,914 00	1,283 50	473,608 91
1909-1910	415,232 00		70,928 86			7,296 55		75,596 96	9,946 50	269,837 52
1910-1911			105,009 07			9,135 49		100,257 89	14,028 30	378,010 70



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1910-1911	445,135 00	156,485 00	143,227 13	4,195,756 04	1,437 84	8,730 01	1,310 00	42,111 92	20,142 85	287,054 96
1911-1912	391,703 12	102,070 00	184,825 92	1,967,182 85	3,256 99	11,239 14	1,400 00	44,167 03	14,745 50	400,638 61
1912-1913	337,055 00	85,940 00	168,904 42	1,650,491 87	6,157 27	14,483 91	1,040 00	17,866 65	11,380 00	463,738 75
1913-1914	317,412 00	61,660 00	187,052 46	1,279,223 51	240 00	16,056 07	1,350 00	40,148 65	8,402 00	378,365 33
1914-1915	238,295 00	28,720 00	114,982 17	691,122 56	80 00	14,290 23	970 00	33,234 14	4,776 10	310,934 29
1915-1916	170,350 00	22,760 00	112,782 70	1,073,970 21		11,485 83	470 00	19,495 98	3,475 00	378,960 68
1916-1917	112,110 20	14,690 00	112,711 33	2,707,203 99	332 61	13,976 95	560 00	21,212 91	2,910 00	429,403 09
1917-1918	83,180 00	7,870 00	89,371 59	3,036,094 55	131 47	12,066 22	250 00	26,513 84	2,200 00	482,006 25
1918-1919	42,190 00		49,225 97	2,192,860 81	323 41	11,039 54	100 00	77,291 91	360 00	408,728 28
1919-1920	67,460 00		78,913 74	2,799,305 09	80 00	17,143 19	255 00	28,535 19	340 00	589,780 21
1920-1921	53,880 00		70,492 66	1,721,171 61		16,333 67	200 00	23,149 23	370 00	705,313 77
Total	5,954,314 09	1,002,736 16	1,768,415 28	28,351,818 36	3,821,136 39	239,237 16	20,481 70	1,851,955 73	316,488 29	10,132,574 79







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1913 1914	84,926 15	320 00	889,863 15	48,800 33		3,313,819 65	277,309 33	3,036,510 32
1914 1915	101,710 58	400 00	1,600,455 09	37,895 97		3,177,866 73	317,764 75	2,860,101 98
1915 1916	118,955 02	160 00	493,280 97	37,493 53		2,445,639 92	143,942 57	2,299,697 35
1916 1917	128,341 50		600,934 13	45,851 45		4,190,238 16	134,243 14	4,055,995 02
1917 1918	125,300 69	249 00	634,027 95	52,160 52		4,557,810 08	113,680 44	4,444,129 04
1918 1919	148,179 55		630,975 74	55,006 72		3,616,281 93	76,031 02	3,540,250 91
1919 1920	183,661 96		896,413 40	76,742 07		4,758,920 85	116,249 03	4,622,671 82
1920 1921	183,756 97		1,234,558 49	76,850 09		4,086,076 49	130,750 93	3,955,325 56
Total	1,786,806 35	242,515 92	16,993,434 88	801,705 41	1,947 32	74,173,489 41	2,775,644 33	71,397,845 08

• Including the scrip.



STATEMENT showing yearly the gross revenue (in cash only) received from all sources from July 1, 1901, to March 31, 1921

Fiscal Year	Dominion Lands	School Lands	Seed Grain	Ordinance Lands	Fines and Forfeitures	Registration Fees	Casual Revenue	Chinese Immigration Revenue	Total
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1901-1902	1,251,333 56	193,410 75	20,293 06	16,967 36	1,955 61	50,854 99	3,900 62	...	1,541,715 95
1902-1903	1,716,597 20	392,206 93	28,789 97	17,612 79	5,220 88	81,401 18	2,230 26	...	2,244,062 21
1903-1904	1,478,106 33	233,769 62	26,122 30	30,494 31	5,911 92	109,233 73	3,402 94	...	1,887,041 18
1904-1905	1,314,485 40	332,914 48	16,471 34	10,346 90	10,018 49	123,082 86	4,258 14	...	1,811,577 61
1905-1906	1,701,580 71	608,960 79	12,577 29	10,893 17	3,304 77	180,310 73	8,496 09	...	2,526,123 55
1906-1907 (9 months)	1,478,749 51	724,353 73	10,850 06	6,663 90	21 00	46,124 20	11,785 81	...	2,278,548 21
1907-1908	1,998,219 92	708,045 83	12,899 84	8,674 95	1,650 00	2,256 65	20,069 03	...	2,751,816 22
1908-1909	2,254,283 98	687,422 74	53,590 86	205,749 96	281 00	1,352 13	26,224 29	...	3,228,904 96
1909-1910	3,007,390 82	1,292,259 95	175,152 72	189,902 48	211 00	1,471 49	42,625 96	...	4,709,014 42
1910-1911	3,302,279 57	1,614,733 93	153,351 14	6,009 34	4,052 22	1,378 19	11,336 06	...	5,093,140 45
	19,506,027 00	6,788,078 75	510,098 58	503,315 19	32,626 89	597,469 15	134,329 20	...	28,071,944 76
1911-1912	3,973,259 74	1,594,533 96	119,634 13	11,566 46	10,510 48	1,066 05	32,824 65	971,339 00	6,714,734 47
1912-1913	3,647,457 61	1,621,508 11	171,342 87	60,607 80	7,150 35	1,241 25	22,873 55	3,549,242 00	9,081,423 54
1913-1914	3,315,259 65	1,215,822 37	176,736 89	5,805 98	7,888 50	966 50	27,884 47	2,644,593 00	7,392,957 36
1914-1915	3,177,386 73	943,717 00	68,263 56	4,416 64	5,828 00	969 85	11,738 10	588,124 00	4,800,445 88
1915-1916	2,443,479 92	934,965 37	2,525,528 50	5,997 98	3,075 21	908 15	28,002 62	19,389 00	5,961,346 45
1916-1917	4,189,905 55	1,699,370 06	3,652,729 05	5,553 26	2,184 72	796 85	15,618 26	140,487 00	9,706,644 75
1917-1918	4,557,438 61	2,836,216 40	2,613,708 67	7,929 75	3,686 00	562 25	9,074 15	336,757 00	10,365,372 83
1918-1919	3,615,958 52	5,087,875 81	1,378,275 76	4,819 27	35 00	789 22	12,381 71	...	10,100,175 29
1919-1920	4,738,840 85	3,900,091 75	1,155,354 64	9,840 33	70 00	430 78	22,837 87	...	9,827,466 22
1920-1921	4,086,076 49	4,480,270 67	773,200 67	8,887 88	1,139 75	448 31	811,970 45	...	10,161,994 22
	37,743,063 67	24,311,371 50	12,634,774 74	125,425 35	41,568 01	8,179 21	995,205 83	8,249,931 00	84,112,519 31
Increase	18,237,036 67	17,526,292 75	12,124,676 16	...	8,941 12	...	860,576 83	...	56,040,574 55
Decrease	...	...	...	377,889 84	...	589,289 94	...	...	...



## SESSIONAL PAPER No. 25

## STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year Ended March 31, 1921, as Compared with the Previous Year.

Particulars	Fiscal Year		Increase	Decrease	Net Increase
	1920-21	1919-20			
<i>Rocky Mountains Park</i>	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Rent .....	11,784 15	9,617 18	2,166 97		
Timber dues ..	1,131 98	586 62	545 36		
Water rates (sulphur) ..	801 38	862 16		60 78	
Cold water rates .....	8,580 08	6,462 48	2,117 60		
Sewer rates .....	3,065 21	2,554 86	510 35		
Transfer fees .....	207 00	120 00	87 00		
Cave and Basin bathing tickets .....	10,578 20	9,037 95	1,540 25		
Livery license .....	307 00	290 00	17 00		
Pool, billiards, and bowling licenses .....	260 00	190 00	70 00		
Boat licenses .....	103 00	161 00		58 00	
Butcher licenses .....	90 00	90 00			
Grazing rental .....	521 00	379 00	142 00		
Hot springs—bathing tickets .....	6,886 35	5,982 65	903 70		
Telephone rent .....	4,044 74	2,956 84	1,087 90		
Lines .....	896 00	482 00	414 00		
Peddlers' licenses ..	70 00	64 00	6 00		
Guides' licenses ..	67 50	60 00	7 50		
Camping permits .....	233 00	99 00	134 00		
Cemetery lots .....	43 00	102 00		59 00	
Tea Room licenses .....	220 00	200 00	20 00		
Sand .....	20 25	28 00		7 75	
Dog licenses .....	357 00	346 00	11 00		
Automobile licenses ..	5,887 00	3,935 50	1,951 50		
Scales .....	32 00	30 75	1 25		
Ice .....	6 25	11 25		5 00	
Sale of lime .....	15 25	15 25			
Theatre licenses ..	22 00	40 00		18 00	
Building permits .....	54 00	65 00		11 00	
Garden and dairy licenses .....		5 00		5 00	
Gum machines .....	48 00	64 00		16 00	
Golf coupons .....	3,643 00	3,025 00	618 00		
Miscellaneous .....	735 34	335 74	399 60		
Hay dues .....	0 55	1 35		0 80	
Draying licenses .....		20 00		20 00	
Chauffeurs' licenses ..	171 00	110 00	61 00		
Restaurant licenses ..	80 00		80 00		
	60,961 23	48,330 58	12,891 98	261 33	12,630 65
<i>Glacier Park</i>					
Rent .....	33 07	14 75	18 32		
Camping permits .....	2 00	2 00			
Grazing rental .....	35 00		35 00		
Timber dues .....	2 25	1 75	0 50		
Dog licenses .....	27 00		27 00		
Restaurant licenses .....	20 00		20 00		
Boat licenses .....	3 00		3 00		
Guides' licenses .....	2 50		2 50		
Drivers' and livery licenses .....	106 00		106 00		
	230 82	18 50	212 32		212 32
<i>Elk Island Park</i>					
Camping permits .....	3 00	3 00			
Boat licenses .....	26 00	2 00	24 00		
Tea Room licenses .....		10 00		10 00	
Building permit .....	2 00	1 00	1 00		
Miscellaneous .....	0 50		0 50		
	31 50	16 00	25 50	10 00	15 50



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STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year Ended March 31, 1921, as Compared with the Previous Year.—Continued.

Particulars	Fiscal Year		Increase	Decrease	Net Increase
	1920-21	1919-20			
<i>Jasper Park</i>	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Rent.....	3,018 23	1,866 16	1,152 07		
Timber dues.....	84 33	18,057 25		17,972 92	
Building permits.....	35 00	2 00	33 00		
Boat licenses and ferry fees.....	20 00	20 00			
Hay dues.....	5 70	6 50		0 80	
Peddlers' licenses.....	34 00	24 00	10 00		
Fines.....	192 00	245 00		53 00	
Grazing rental.....	368 00	242 00	126 00		
Guides' licenses.....	54 40	30 00	24 40		
Drivers' and livery licenses.....	313 00	153 00	160 00		
Camping permits.....	26 00	16 00	10 00		
Pool, billiards, and bowling licenses.....	210 00	170 00	40 00		
Dog licenses.....	208 00	197 00	11 00		
Restaurant licenses.....	120 00	20 00	100 00		
Butcher licenses.....	50 00	10 00	40 00		
Telephone rent.....	55 00	45 00	10 00		
Cold water rates.....	33 00	31 00	2 00		
Miscellaneous.....	109 76	68 52	41 24		
Theatre licenses.....	33 00	12 00	21 00		
Transfer fees.....	12 00	8 00	4 00		
Sand.....	8 70	1 50	7 20		
Cemetery lots.....	33 00	3 00	30 00		
Coal leases.....	282 00		282 00		
Chauffeurs' licenses.....	1 00		1 00		
Garden and Dairy.....	80 00		80 00		
Auto permits.....	50 00		50 00		
Cat taxes.....	37 00		37 00		Decrease
	5,473 12	21,227 93	2,271 91	18,026 72	15,754 81
<i>Waterton Lakes Park</i>					
Rent.....	371 73	421 42		49 69	
Camping permits.....	170 00	157 00	13 00		
Timber dues.....	110 00	13 75	96 25		
Fines.....	38 00	94 00		56 00	
Guides' licenses.....	10 00	7 50	2 50		
Grazing rental.....	1,912 00	2,916 00		1,004 00	
Hay dues.....	4 00	9 50		5 50	
Drivers' and livery licenses.....	44 00		44 00		
Boat licenses.....	68 00	61 50	6 50		
Transfer fees.....	10 00	2 00	8 00		
Building permits.....	4 00	4 00			
Tea room licenses.....	10 00	20 00		10 00	
Miscellaneous.....		54 75		54 75	
Pool and billiards license.....		74 00		74 00	
Theatre licenses.....		10 00		10 00	
Dog licenses.....	9 00	3 00	6 00		
Restaurant licenses.....	10 00		10 00		
Impounding cattle.....	125 40		125 40		Decrease
	2,896 13	5,848 42	311 65	1,263 94	952 29
<i>Moose Mountain Buffalo Park</i>					
Grazing rental.....	35 60	10 00	25 60		
Rent.....		25 60		25 60	
	35 60	35 60	25 60	25 60	



## SESSIONAL PAPER No. 25

STATEMENT of Revenue Collected within Canadian National Parks for the Fiscal Year Ended March 31, 1921, as compared with the Previous Year.—*Concluded!*

Particulars	Fiscal Year		Increase	Decrease	Net
	1920-21	1919-20			
<i>Antelope Park</i>	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Grazing rental.....	409 60	409 60			
<i>Yoho Park</i>					
Timber dues.....	172 50	152 75	19 75		
Rent.....	517 39	581 70		64 31	
Transfer fees.....	8 00	20 00		12 00	
Camping permits.....	24 00	34 00		10 00	
Cemetery lots.....	3 00	3 00			
Grazing rental.....	52 00	34 00	18 00		
Fines.....	5 00	3 00	2 00		
Guides' licenses.....	15 00		15 00		
Miscellaneous.....	1 20		1 20		
Pool, biliards and bowling licenses.....	30 00		30 00		
Restaurant licenses.....	30 00		30 00		
Butchers' licenses.....	10 00		10 00		
Dog licenses.....	126 00		126 00		
Boat licenses.....	6 00		6 00		
Drivers' and livery licenses.....	96 00		96 00		
Auto permits.....	110 00		110 00		
	1,206 09	828 45	463 95	86 31	377 64
<i>Buffalo Park</i>					
Timber dues.....	16 75	10 25	6 50		
Hay dues.....	25 40	46 30		20 90	
Grazing rental.....	72 00	1,893 00		1,821 00	
Auto permits.....	10 00		10 00		Decrease
	124 15	1,949 55	16 50	1,841 90	1,825 40
<i>Fort Anne Park</i>					
Hay dues.....	38 00	47 00		9 00	Decrease 9 00
<i>Pt. Pelee Park</i>					
Rent.....	1,341 15	30 44	1,310 71		1,310 71
<i>Miscellaneous</i>					
Taxidermists' fees.....	4,102 70		4,102 70		4,102 70
Totals.....	76,850 09	76,742 07	21,607 22	21,499 20	108 02







PART I

DOMINION LANDS

REPORT OF THE COMMISSIONER J. W. GREENWAY

<i>Applications for Patent —</i>	1919-20	1920-21
Number examined .. .. .	56,951	77,313
New applications .. .. .	23,377	16,041
Applications accepted and notifications issued .. ..	11,359	13,080
Certificates of recommendation sent out .. ..	6,883	5,221

REPORT OF THE CHIEF INSPECTOR OF DOMINION LAND AGENCIES,  
H. G. CUTTLE

The general condition of all offices is good and a satisfactory service is being given the public. Full details of the work done in the land agencies, sub-agencies, and by the homestead appraisers, will be furnished in the reports of Mr. O. Neff, Inspector of Agencies for Manitoba and Saskatchewan, and Mr. J. W. Martin, Inspector for Alberta and British Columbia.

During the past year the following sub-agencies have been closed:—

*Alberta.*—Hanna, Wainwright, Mosside, Frog Lake, Whitford, Pine Creek, and St. Paul de Metis.

*British Columbia.*—Golden.

*Saskatchewan.*—Kindersley, Ponteix, Weyburn, Alsask, Yorkton, and Shaunavon.

The seed gain collections for the year amounted to approximately \$650,000, of which over \$70,000 was paid directly through my office. Included in the collections are a great number of very old liens; in fact some dating back as far as 1879. Although the collections have not been so great as last year, owing to the low prices which were received for all grain, I consider that they have been very satisfactory.

The seed grain distribution for 1921 is very much smaller than last year; although the crop was not heavy last year, most of the settlers were able to save enough grain to do their seeding this year, they having been advised to do so by the collectors last fall. As there was a very good crop of hay, the feed situation was good, and I feel confident that if we are fortunate enough to have an average crop this season, there should be no need for the department to make further advances. In comparison with last year it will be interesting to note that for the same period last year there were 2,003 more applications than this year, and 135,012 bushels of wheat, 157,049 bushels of oats, and 4,758 bushels of barley less being granted. I expect, however, to have a considerable number of applications during the month of April.



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REPORT OF THE INSPECTOR OF DOMINION LANDS AGENCIES,  
O. NEFF, MOOSOMIN, SASK.

Agency	Homestead entries granted	Land Sales	Appli- cations for Patent received	Land Entries Cancelled	Permits Issued	
		Ordinary and School Lands			Timber	Hay
Battleford.....	368	25	479	1,020	505	1,357
Dauphin.....	358	48	865	524	466	1,349
Moosejaw.....	240	16	1,738	449	2	1,396
Prince Albert.....	671	35	854	890	872	1,857
Saskatoon.....	163	45	1,080	341	111	1,388
Swift Current....	227	12	2,598	992	86	625
Winnipeg.....	367	73	1,222	825		1
The Pas*		Mining locations (220)		Assessment Payments (40)		
Total.....	2,394	254	8,836	5,041	2,042	7,973
Compared with 1919-20.....	3,292	285	14,352	4,526	4,287	8,669
Compared with 1918-19.....	2,007	287	13,132	2,102	1,914	5,992

\*The Pas Office is that of a Mining Recorder who is also sub-agent.

DOMINION LAND SUB-AGENCIES—Manitoba and Saskatchewan—Work performed during  
the Departmental Year ending March 31, 1921

Name	Sub-Agency	Applications for						
		Home- steads	Grazing Lease	Grazing Permits	Patent	Inspec- tion	Timber Permits	Hay Permits
C. J. Lee.....	Assiniboia.....	62	4	20	460	94	1	35
A. G. H. Mast.....	Canwood.....	14	1	5	45	4	41	2
J. Cusack.....	Empress.....	1	1	2	133	18	1	10
G. Blackstock.....	Kindersley.....	4		2	44	2		3
W. H. Holland.....	Lloydminster ....	16	29	23	41	9	24	78
C. H. Stockdale.....	Maple Creek.....	33	17	56	614	34	43	54
J. McCordie.....	Meadow Lake.....	43	27	6	37	25	57	192
J. W. Young.....	Melfort.....	58		32	116	55	19	31
J. Deans.....	North Battleford.	121	40	38	87	55	36	216
W. Giroux.....	Ponteix.....	32	11	2	116	22		57
D. McMurphy.....	Preeceville.....	41			179	28	1	66
R. J. Campbell.....	Shaunavon.....	13	2		59	14	2	1
Dan Hughes.....	Turtleford.....	32	1		30	9		
A. C. Reed.....	Turtleford.....	7	2	3	15	7	9	
Wm. Buxton.....	Tisdale.....	186	4	4	186	106	74	67
W. B. McLellan.....	The Pas.....	7	16				20	194
M. Langstaff.....	Wadena.....	49		1	100	65		
T. A. Underwood.....	Weyburn.....	17	2	6	55	12		46
J. A. Duncan.....	Yorkton.....	11			37	9		12
Total.....		747	157	200	2,354	568	328	1,064
Compared with 1919-20.....		836	350		4,317	749	284	1,316
Compared with 1918-19.....		677			4,282	477	272	1,124



## SESSIONAL PAPER No. 25

STATEMENT showing Principal Work performed by Homestead Inspectors in Manitoba and Saskatchewan for the Departmental Year ending March 31, 1921

Name	Headquarters	Land Inspections made	Applications for Patent	Miles Travelled	
				Wagon	Rail
D. Anderson.....	Battleford..	415	54	8,201	100
N. F. Leach.....	"	357	168	6,374	4,840
G. L. Speers.....	Dauphin....	492	189	5,377	4,807
T. C. Martin.....	"	578	196	9,369	4,607
Robt. Hunt.....	"	420	99	5,713	1,057
D. L. Burgess.....	Prince Albert..	1	.....	14	166
W. J. Morrison....	"	522	100	3,648	2,603
S. Taylor.....	"	414	14	3,665	1,247
E. Webb-Bowen..	"	472	11	3,340	3,255
W. W. Whelan...	"	389	7	2,371	1,742
C. E. Barr.....	Moosejaw....	352	38	9,572	2,007
W. Erratt.....	"	582	14	9,572	1,484
A. Hamilton.....	"	290	121	5,460	14,091
E. J. Hober.....	"	369	.....	10,255	2,537
F. G. Arnold.....	"	.....	44	91	3,579
A. E. Mossess.....	Saskatoon....	338	125	6,277	1,963
A. Henke.....	"	270	44	5,998	1,422
J. A. Balfour.....	"	288	27	3,570	3,944
A. Smyth.....	"	472	95	7,485	4,219
J. DeBalinhard...	"	236	27	5,652	3,178
L. Lepine.....	Winnipeg.....	350	82	2,424	5,444
W. Lagimodiere...	"	507	201	3,953	3,074
H. L. Mabb.....	"	30	7	498	408
W. D. Gillespie..	"	510	175	4,990	3,958
Geo. McGowan....	"	541	255	4,309	5,484
H. W. Mabb.....	"	160	91	2,004	686
W. Shields.....	Swift Current...	381	181	10,447	.....
J. Furnis.....	"	244	34	5,867	958
P. McLaren.....	"	421	148	9,635	2,323
J. A. McDonald... ..	"	648	199	9,660	464
Total.....		11,049	2,746	165,791	85,647
Compared with 1919-20....		10,222	3,050	149,521	85,101
Compared with 1918-19.....		5,834	2,038	117,491	81,957

REPORT OF THE INSPECTOR OF DOMINION LANDS AGENCIES,  
J. W. MARTIN, CALGARY, ALTA.

DOMINION LANDS AGENCIES.—Principal Transactions for the Departmental Year ending March 31, 1921

Period	Home- stead entries granted	Soldier grants	Land Sales	Applica- tions for patent received	Land entries cancelled	Permits issued	
			Ordinary and school lands			Timber	Hay
Calgary .....	280	212	29	1,359	481	397	865
Edmonton.....	1,296	495	140	3,430	1,673	1,544	2,254
Grande Prairie.....	547	208	15	539	581	536	.....
Kamloops.....	71	40	17	106	42	523	37
Lethbridge.....	80	73	13	1,150	265	415	150
New Westminster.....	44	11	9	31	47	.....	.....
Peace River.....	671	184	25	289	948	559	524
Revelstoke.....	5	9	1	43	19	181	.....
Total.....	2,994	1,232	249	6,947	4,056	4,155	3,830
1919-20.....	3,583	2,912	288	7,427	4,005	3,779	4,528



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DOMINION LANDS SUB-AGENCIES, ALBERTA AND BRITISH COLUMBIA.—Work performed during the Departmental Year ending March 31, 1921

Name of Sub-Agent	Sub-Agency	Period	Applications for					
			Home-steads	Soldier grants	Patent	Inspection	Timber Permits	Hav Permits
Spicer, S. E.....	Alsask.....	9½ months..	5	12	129	5	...	9
Rennison, G. M.....	Athabasca.....	.....	103	19	76	49	40	240
Dodds, G. E.....	Durlingville.....	11 months..	55	12	90	39	47	253
Asselin, O.....	Donnelly.....	1 " ..	1	.....	8	1	11	.....
Glover, F.....	Edson.....	.....	59	13	35	21	9	20
Jackson, W.....	Entwistle.....	.....	40	6	65	17	9	39
Cusack, J.....	Empress.....	.....	23	31	190	25	.....	11
Potts, C.....	Ft. McMurray...	.....	7	1	4	.....	1	5
Barber, J. C.....	Ft. St. John.....	11 months..	42	14	7	25	.....	7
Edgecombe, H.....	Ft. Vermilion....	6 " ..	31	.....	5	11	.....	80
McGowan, J.....	Frog Lake.....	9 " ..	6	12	25	5	1	20
Wenman, W.....	Golden.....	8½ " ..	2	6	11	1	26	...
Reynolds, H. H.....	Grouard.....	.....	63	10	32	22	23	115
Treneman, J. C.....	Hanna.....	8½ months..	11	9	197	3	.....	13
Holland, W. H.....	Lloydminster.....	.....	11	3	14	7	5	15
Hamel, P. D.....	Lac la Biche.....	2 months..	11	.....	14	2	9	.....
Whitaker, J.....	Mosside.....	9 " ..	27	7	24	8	.....	5
Robinson, A. W.....	Medicine Hat.....	.....	24	15	399	16	.....	18
McDonald, S. A.....	Pine Creek.....	9 months..	16	4	49	11	7	31
Agar, Norval.....	Provost.....	.....	10	8	171	7	1	79
Jamieson, T.....	Pouce Coupe.....	.....	98	34	83	63	38	34
Hankinson, R. T....	Ry. Mt. House....	.....	94	15	119	56	31	48
Row, Cuthbert.....	Red Deer.....	.....	23	1	106	12	3	56
Lacey, J.....	Salmon Arm.....	.....	28	4	9	10	2	...
Gray, W. B.....	Stettler.....	.....	14	9	82	24	.....	8
Racicot, B.....	St. Paul.....	10½ months	20	8	117	12	12	57
LaPlante, J. R.....	St. Lina.....	.....	66	24	81	45	32	60
Fildes, J. M.....	Spirit River.....	.....	119	59	84	47	40	75
Sutton, W. E.....	Vermilion.....	.....	8	4	34	14	4	5
Todd, H. E.....	Wetaskiwin.....	.....	43	4	9	15	6	21
McLeod, H. W.....	Wainwright.....	9 months..	4	2	53	7	.....	.....
Torgerson, J. S.....	Whitecourt.....	11½ " ..	25	7	16	19	62	6
Hughson, W. S.....	Whitford.....	8 " ..	6	.....	5	.....	1	5
Wood, W. J.....	Westlock.....	9 " ..	61	17	104	35	119	79
Rayment, M.....	Youngstown.....	.....	18	17	255	25	.....	41
Wenham, M.....	Yeoford.....	.....	29	2	36	22	3	35
Totals.....	.....	.....	1,203	389	2,738	681	542	1,490
1919-20.....	.....	.....	1,172	643	4,648	727	607	1,759



## SESSIONAL PAPER No. 25

STATEMENT showing Principal Work performed by Homestead Inspectors in Alberta and British Columbia for Departmental Year ending March 31, 1921

Name of Homestead Inspector	Headquarters	Period	Land Inspections made	Applications for patent taken	Miles Travelled	
					Wagon	Rail
Benzie, J. M.....	Kamloops.....		343	46	4,614	2,570
Cook, H.....	Revelstoke.....		114	13	891	4,167
Cunningham, T. J.....	Edmonton.....		321	48	5,615	3,051
Doze, I. S.....	Edmonton.....		407	6	3,831	1,340
Fletcher, J.....	Grande Prairie.....	3 months..	22		361	
Fleming, G. W.....	Calgary.....		133	59	3,853	3,624
Griffin, A. H.....	Edmonton.....		636	45	5,003	3,286
Grasse, P. L.....	Calgary.....		260	23	3,072	2,879
Hagen, S. C.....	Edmonton.....		493	38	4,315	2,448
Horne, J. A.....	Edmonton.....		293	23	5,295	2,430
Huntley, J. R.....	Lethbridge.....	5 months..	107	33	2,830	468
Kembry, R. A.....	Calgary.....		350	42	8,027	4,673
Key, A. E.....	Peace River.....		110	15	1,595	2,677
Magee, W. D.....	New Westminster.....	Agent.....	139		790	1,763
McMullen, J. E.....	Peace River.....		380	7	4,080	1,658
McCowan, H. S.....	Edmonton.....		325	28	4,410	934
McConnochie, A.....	Edmonton.....		324	55	2,728	2,936
Mayberry, W. J.....	Lethbridge.....		517	97	7,119	1,923
Newton, T. M.....	Grande Prairie.....		172	8	5,920	
Nurcombe, J.....	Edmonton.....	4 months..	267	16	1,432	1,084
Smith, L. T.....	Grande Prairie.....		192	4	3,571	70
Temporary, Wm.....	Calgary.....	7 months..	98	3	2,439	264
Taylor, P. E.....	Edmonton.....	10 "	256	13	4,332	1,553
Woodlock, P. A.....	Calgary.....		430	48	8,709	7,358
Wynne, A. E.....	Edmonton.....		259	19	7,573	1,025
Wilcox, D. E.....	Lethbridge.....		302	127	6,773	974
Totals.....			7,250	816	109,178	55,155
1919-20 .....			7,567	745	106,027	62,399



REPORT OF THE AGENT OF DOMINION LANDS, D. J. ROSE,  
BATTLEFORD, SASK.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

Land Patents Branch—	Number.	Revenue.	Total.
Homestead fees .. .. .	368	\$ 3,680.00	
Improvements .. .. .	57	3,821.55	
Land sales (Cash) .. .. .	25	1,250.13	
Pre-emption payments .. .. .	86	26,317.23	
Purchased homestead payments .. .. .	26	4,327.44	
Searches, etc., .. .. .	287	72.75	
Applications for patent .. .. .	492		
Applications for inspection .. .. .	322		
Entries cancelled .. .. .	1,020		
Sundries .. .. .	5	279.75	
Total .. .. .			\$ 39,743.85
Timber and Grazing Branch—			
Timber permits .. .. .	491	1,636.18	
Timber permits (Excess) .. .. .	66	544.50	
Timber seizures .. .. .	22	229.50	
Hay permits .. .. .	961	2,611.25	
Hay Permits (Excess) .. .. .	17	22.35	
Hay (sale) .. .. .	1	13.50	
Grazing rentals (Cash) .. .. .	406	2,614.75	
Grazing (assignments) .. .. .	8	16.00	
Hay seizure .. .. .	2	3.20	
Total .. .. .			\$ 7,691.23
Forestry Branch—			
Permit fees and rental .. .. .	257	433.75	
Permit fees and rental (excess) .. .. .	1	1.50	
Seizures .. .. .	18	54.52	
Grazing rent, etc., .. .. .	171	3,227.06	
Hay dues, etc., .. .. .	28	481.25	
Total .. .. .			\$ 4,198.08
Reclamation Service—			
Sale .. .. .	1	41.39	
Total .. .. .			\$ 41.39
Mining Lands and Yukon Branch—			
Mining fees .. .. .	105	411.50	
Rental .. .. .	34	10,729.42	
Total .. .. .			\$ 11,140.92
School Lands Branch—			
Timber permits .. .. .	1	1.50	
Timber seizures .. .. .	5	30.50	
Hay permits .. .. .	400	898.75	
Hay sale .. .. .	1	12.50	
Grazing rentals .. .. .	455	12,450.56	
Hay permits (excess) .. .. .	14	21.10	
Mining fees .. .. .	5	1,005.50	
Cultivation permits .. .. .	1	13.50	
Total .. .. .			\$ 14,433.91
Miscellaneous—			
Seed grain and provision payments .. .. .	102	11,121.04	
Sundries .. .. .	1	.25	
Total .. .. .			\$ 11,121.29
Grand Total .. .. .			\$88,375.67



## SESSIONAL PAPER No. 25

# REPORT OF THE AGENT OF DOMINION LANDS, W. E. TALBOT, CALGARY, ALTA.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Soldier grants .. .. .	212		
Homestead fees .. .. .	279	\$ 2,790.00	
Pre-emption sale fees .. .. .	4	40.00	
Improvements .. .. .	117	6,572.53	
Land sales .. .. .	30	4,214.65	
Pre-emption payments .. .. .	839	328,533.35	
Purchased homestead payments .. .. .	78	16,437.34	
Searches, etc., .. .. .	1,833	304.55	
Applications for patent .. .. .	1,449		
Applications for cancellation .. .. .	699		
Entries cancelled .. .. .	481		
Total .. .. .			\$ 358,892.42
<i>Timber and Grazing Branch—</i>			
Ground rent .. .. .	34	\$ 4,512.30	
Royalty on sales .. .. .	39	21,800.57	
Timber permits .. .. .	170	9,438.50	
Timber seizures .. .. .	6	275.73	
Hay permits .. .. .	284	1,328.00	
Grazing rentals .. .. .	633	8,369.66	
Sundries .. .. .	11	22.00	
Total .. .. .			\$ 45,746.76
<i>Forestry Branch—</i>			
Permit fees and rental .. .. .	227	\$ 8,160.39	
Seizures .. .. .	5	416.16	
Grazing rent .. .. .	227	9,081.54	
Hay dues .. .. .	19	109.25	
Total .. .. .			\$ 17,767.34
<i>Reclamation Service—</i>			
Reservoir rental .. .. .	1	\$ 73.05	
Total .. .. .			\$ 73.05
<i>Mining Lands and Yukon Branch—</i>			
Mining fees (quartz and placer) .. .. .	169	\$ 753.50	
Rental (coal) .. .. .	426	45,030.06	
Royalty .. .. .	358	53,742.14	
Petroleum and natural gas .. .. .	883	85,009.08	
Sundries .. .. .	6	130.90	
Total .. .. .			\$ 184,665.68
<i>School Lands Branch—</i>			
General sales .. .. .	18	\$ 9,269.35	
Timber permits .. .. .	5	67.98	
Hay payments .. .. .	562	1,497.05	
Grazing rentals .. .. .	1,366	41,242.99	
Coal rentals and fees .. .. .	47	3,301.33	
Coal royalty .. .. .	24	1,373.78	
Petroleum and natural gas .. .. .	137	12,953.48	
Total .. .. .			\$ 69,705.96
<i>Miscellaneous—</i>			
Seed grain and provision payments .. .. .	509	\$ 95,132.15	
Total .. .. .			\$ 95,132.15
Grand total .. .. .			\$ 771,983.26



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REPORT OF THE AGENT OF DOMINION LANDS, E. WIDMEYER,  
DAUPHIN, MAN.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

[illegible]



# REPORT OF THE AGENT OF DOMINION LANDS, A. NORQUAY, EDMONTON, ALTA.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Soldier grants .. .. .	495		
Homestead fees .. .. .	1,296	12,930.00	
Improvements.. .. .	266	12,484.90	
Land sales (cash) .. .. .	140	9,502.88	
Half-breed scrip .. .. .	1		
Pre-emption payments .. .. .	1	197.20	
Purchased homestead payments .. .. .	7	1,344.61	
Searches .. .. .	386	100.15	
Applications for patent .. .. .	1,647		
Applications for inspection.. .. .	3,322		
Entries cancelled .. .. .	1,673		
Sundries .. .. .	16	160.00	
Total .. .. .			\$ 36,719.74
<i>Timber and Grazing Branch—</i>			
Bonus .. .. .	4	21,549.61	
Ground rent .. .. .	60	7,213.31	
Royalty on sales .. .. .	45	18,789.18	
Timber permits .. .. .	1,388	35,020.42	
Timber seizures .. .. .	96	5,078.09	
Hay permits .. .. .	1,819	3,250.17	
Grazing rentals (cash) .. .. .	294	1,371.35	
Grazing rentals (scrip).. .. .	1	89.51	
Sundries .. .. .	724	60,479.96	
Total.. .. .			\$ 152,841.60
<i>Forestry Branch—</i>			
Timber dues .. .. .	18	14,839.56	
Permit fees and rental .. .. .	110	29.50	
Seizures .. .. .	3	88.35	
Grazing rent, etc. .. .. .	45	547.84	
Hay dues, etc.. .. .	45	398.35	
Total .. .. .			\$ 15,903.60
<i>Reclamation Service—</i>			
Sales .. .. .	4	309.25	
Total .. .. .			\$ 309.25
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. .. .	139	455.30	
Rental .. .. .	265	48,244.49	
Royalty .. .. .	79	41,596.38	
Assessment payments .. .. .	12	3,446.50	
Coal permits .. .. .	1	2.10	
Sundries.. .. .	706	141,235.95	
Total .. .. .			\$ 234,980.72
<i>School Lands Branch—</i>			
General sales .. .. .	2	1,029.92	
Timber permits .. .. .	46	1,835.62	
Hay permits .. .. .	690	1,174.00	
Grazing rentals .. .. .	510	12,658.42	
Coal rental .. .. .	13	717.46	
Coal royalty .. .. .	2	415.33	
Coal permits (petroleum) .. .. .	10	610.00	
Cultivation permits.. .. .	1	15.00	
Sundries .. .. .	81	2,719.58	
Total.. .. .			\$ 21,175.33
<i>Miscellaneous—</i>			
Seed grain and provision payments.. .. .	320	15,107.82	
Indian lands sale.. .. .	1	428.04	
Total .. .. .			\$ 15,535.86
Grand total .. .. .			\$ 477,466.10



REPORT OF THE AGENT OF DOMINION LANDS, F. L. CHRISTIE,  
GRANDE PRAIRIE, ALTA.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Homestead fees .. .. .	547	\$ 5,470.00	
Improvements .. .. .	71	3,763.25	
Land sales (cash) .. .. .	15	885.52	
Searches, etc. . . . .	21	5.25	
Applications for patent .. .. .	539		
Applications for inspection .. .. .	323		
Entries cancelled .. .. .	581		
Soldier grants .. .. .	218		
Total .. .. .			\$ 10,124.02
<i>Timber and Grazing Branch—</i>			
Bonus .. .. .	1	6.00	
Timber permits .. .. .	536	1,371.68	
Timber seizure .. .. .	1	10.34	
Hay permits .. .. .	225	464.70	
Grazing rentals (cash) .. .. .	105	1,422.81	
Ass gnment .. .. .	1	2.00	
Timber permits (excess) .. .. .	72	624.11	
Hay permits (excess) .. .. .	4	11.20	
Total .. .. .			\$ 3,912.84
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. .. .	26	130.00	
Rental .. .. .	10	2,220.10	
Petroleum .. .. .	789	139,746.50	
Royalty .. .. .	8	29.40	
Total .. .. .			\$ 142,126.00
<i>Reclamation Service—</i>			
Sales .. .. .	1	4,306.66	
Total .. .. .			\$ 4,306.66
<i>School Lands Branch—</i>			
Hay permit (excess) .. .. .	1	.50	
Hay permits .. .. .	70	117.20	
Grazing rentals .. .. .	67	1,858.95	
Mining fees, petroleum and gas. . . . .	29	2,523.50	
Sundries .. .. .	1	22.00	
Total .. .. .			\$ 4,522.15
<i>Miscellaneous—</i>			
Seed grain and provision payments .. .. .	10	3,219.12	
Total .. .. .			\$ 3,219.12
Grand total .. .. .			\$ 168,210.79



SESSIONAL PAPER No. 25

# REPORT OF THE AGENT OF DOMINION LANDS, W. C. COWELL, KAMLOOPS, B.C.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Homestead fees .. .. .	71	\$ 710.00	
Soldier grants .. .. .	40		
Improvements .. .. .	54	4,433.15	
Land sales .. .. .	17	835.91	
Ground rent .. .. .	1	10.00	
Searches, etc. .. .. .	232	79.82	
Applications for patent.. .. .	106		
Applications for inspection .. .. .	62		
Entries cancelled .. .. .	42		
Sundries .. .. .	4	78.35	
Total .. .. .			\$ 6,147.23
<i>Timber and Grazing Branch—</i>			
Sale scale books .. .. .	19	90.00	
Bonus .. .. .	1	1,726.00	
Ground rent .. .. .	65	6,972.64	
Royalty on sales .. .. .	66	28,185.12	
Timber permits .. .. .	482	7,952.99	
Timber seizures .. .. .	5	1,103.71	
Hay permits .. .. .	15	14.50	
Grazing rentals .. .. .	491	6,986.97	
Fire guarding .. .. .	3	670.54	
Sundries .. .. .	24	104.00	
Total .. .. .			\$ 53,806.47
<i>Forestry Branch</i>			
Timber dues .. .. .	26	303.37	
Permit fees .. .. .	41	10.25	
Seizures .. .. .	1	218.30	
Grazing rent .. .. .	14	144.00	
Hay dues .. .. .	20	111.25	
Total .. .. .			787.17
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. .. .	4	20.00	
Rental .. .. .	11	363.30	
Sundries.. .. .	3	1.50	
Total .. .. .			384.80
<i>Miscellaneous —</i>			
Seed grain collections .. .. .	4	72.22	
Total .. .. .			72.22
Grand total .. .. .			\$61,197.89



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# REPORT OF THE AGENT OF DOMINION LANDS, J. A. REID, LETHBRIDGE, ALTA.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Homestead fees .. . . .	80	\$ 800.00	
Soldier grants .. . . .	73		
Improvements .. . . .	37	2,316.20	
Land sales (cash) .. . . .	14	891.47	
Pre-emption payments .. . . .	303	101,366.87	
Purchased homestead payments .. . . .	18	3,124.57	
Searches, etc. . . . .	252	102.75	
Applications for patent .. . . .	1,150		
Applications for inspection .. . . .	737		
Entries cancelled .. . . .	265		
Total .. . . .			\$108,601.86
<i>Timber and Grazing Branch—</i>			
Timber permits .. . . .	10	\$ 868.75	
Timber seizures .. . . .	1	20.00	
Hay permits .. . . .	84	123.40	
Grazing rentals (cash) .. . . .	1,294	28,852.89	
Improvements .. . . .	2	30.00	
Sundries .. . . .	5	10.00	
Total .. . . .			29,905.04
<i>Forestry Branch—</i>			
Timber dues .. . . .	314	\$ 3,085.75	
Permit fees and rental .. . . .	406	255.34	
Seizures .. . . .	2	41.00	
Grazing rent, etc. . . . .	247	7,390.16	
Hay dues, etc. . . . .	9	15.00	
Total .. . . .			10,787.25
<i>Reclamation Service—</i>			
Sales .. . . .	5	\$ 789.79	
Total .. . . .			789.79
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. . . .	142	\$ 946.00	
Rental .. . . .	80	13,590.85	
Royalty .. . . .	162	41,628.42	
Petroleum and natural gas .. . . .	252	33,570.02	
Sundries .. . . .	2	4.00	
Total .. . . .			89,739.29
<i>School Lands Branch—</i>			
General sales .. . . .	7	\$ 2,772.04	
Hay permits .. . . .	58	47.40	
Grazing rentals .. . . .	515	20,944.10	
Mining fees .. . . .	3	15.00	
Coal rental, petroleum and natural gas .. . . .	21	8,511.40	
Coal royalty .. . . .	12	7,589.60	
Cultivation permits .. . . .	3	153.00	
Sundries .. . . .	1	11.25	
Total .. . . .			40,045.79
<i>Miscellaneous—</i>			
Seed grain and provision payments .. . . .	430	\$ 42,511.15	
Total .. . . .			42,511.15
Grand total .. . . .			\$322,380.17



SESSIONAL PAPER No. 25

# REPORT OF THE AGENT OF DOMINION LANDS, L. P. O. NOEL, MOOSEJAW, SASK.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Soldier grants .. .. .	153		
Homestead fees .. .. .	240	\$ 2,400.00	
Pre-emption fees .. .. .	1	10.00	
Improvements .. .. .	44	3,589.70	
Land sales (cash) .. .. .	17	2,187.41	
Pre-emption payments .. .. .	703	264,075.66	
Purchased homestead payments .. .. .	71	14,489.07	
Searches .. .. .	1,035	258.75	
Applications for patent .. .. .	1,738		
Applications for inspection .. .. .	650		
Entries cancelled .. .. .	449		
Sundries .. .. .	1	10.00	
Total .. .. .			\$287,020.59
<i>Timber and Grazing Branch—</i>			
Hay permits .. .. .	697	\$ 1,355.55	
Grazing rentals (cash) .. .. .	709	6,710.89	
Sundries .. .. .	9	18.00	
Total .. .. .			8,084.44
<i>Forestry Branch—</i>			
Surface rental .. .. .	16	\$ 95.00	
Timber dues .. .. .	123	414.85	
Timber seizures .. .. .	1	5.00	
Grazing rental .. .. .	178	2,105.60	
Hay dues .. .. .	128	1,177.00	
Total .. .. .			3,797.45
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. .. .	216	\$ 1,224.40	
Rental .. .. .	71	4,356.65	
Royalty .. .. .	86	1,923.13	
Sundries .. .. .	4	28.75	
Total .. .. .			7,532.93
<i>School Lands Branch—</i>			
General sales .. .. .	19	\$ 7,510.73	
Timber permits .. .. .	2	8.50	
Hay permits .. .. .	701	1,451.20	
Grazing rentals .. .. .	1,264	32,844.58	
Mining fees .. .. .	12	150.83	
Coal rental .. .. .	13	977.55	
Coal royalty .. .. .	21	1,952.35	
Cultivation permits .. .. .	2	55.00	
Sundries .. .. .	■	273.42	
Total .. .. .			45,224.16
<i>Miscellaneous—</i>			
Seed grain and provision payment .. .. .	487	\$ 94,514.13	
Total .. .. .			94,514.13
Grand total .. .. .			\$446,173.70



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REPORT OF THE AGENT OF DOMINION LANDS, W. D. MAGEE,  
NEW WESTMINSTER, B.C.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Homestead fees .. .. .	44	\$ 440.00	
Soldier grants .. .. .	12		
Improvements .. .. .	20	710.60	
Land sales .. .. .	9	261.41	
Townsite payments .. .. .	11	2,162.11	
Purchased homestead payments .. .. .	19	606.01	
Searches, etc. .. .. .	93	25.95	
Applications for patent .. .. .	36		
Applications for inspection .. .. .	49		
Entries cancelled .. .. .	57		
Sundries .. .. .	9	26.00	
Total .. .. .			4,232.08
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. .. .	75	\$ 375.00	
Rentals .. .. .	556	30,584.55	
Coal applications .. .. .	1	105.00	
Sand, stone and gravel permits .. .. .	4	132.00	
Sundries .. .. .	130	258.00	
Total .. .. .			31,454.55
Grand total.. .. .			\$35,686.63



SESSIONAL PAPER No. 25

# REPORT OF THE AGENT OF DOMINION LANDS, R. M. TREEN, PRINCE ALBERT, SASK.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Homestead fees.. . . . .	671	\$ 6,710.00	
Improvements .. . . . .	103	7,430.05	
Land sales (cash) .. . . . .	35	1,874.16	
Searches, etc... .. . . .	292	73.25	
Applications for patent .. . . . .	859		
Applications for inspection .. . . . .	731		
Entries cancelled .. . . . .	948		
Soldier grants .. . . . .	456		
Total .. . . . .			\$16,087.46
<i>Timber and Grazing Branch —</i>			
Bonus.. . . . .	1	\$ 2,800.00	
Ground rent .. . . . .	59	10,651.91	
Royalty on sales .. . . . .	63	35,036.61	
Timber permits .. . . . .	822	22,947.71	
Timber seizures .. . . . .	79	3,322.86	
Hay permits .. . . . .	1,127	3,541.46	
Grazing rentals (cash) .. . . . .	464	2,169.24	
Grazing rentals (scrip) .. . . . .	3	46.63	
Sundries .. . . . .	6	464.73	
Total .. . . . .			80,981.15
<i>Forestry Branch—</i>			
Timber dues.. . . . .	950	\$ 19,588.69	
Seizures .. . . . .	14	411.06	
Grazing rent, etc. .. . . . .	88	1,329.94	
Hay dues, etc. .. . . . .	145	913.70	
Total .. . . . .			22,243.39
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. . . . .	39	\$ 91.00	
Coal permits .. . . . .	4	91.00	
Petroleum .. . . . .	11	6,954.65	
Total .. . . . .			4,065.65
<i>School Lands Branch—</i>			
General sales.. . . . .	2	\$ 924.71	
Timber permits .. . . . .	49	925.33	
Hay permits .. . . . .	378	731.00	
Grazing rentals .. . . . .	288	5,714.80	
Coal permits (seizures.. . . . .	5	163.00	
Cultivation permits (Ground rent) .. . . . .	5	33.80	
Total.. . . . .			8,492.64
<i>Miscellaneous—</i>			
Seed grain and provision payments .. . . . .	79	\$ 4,034.23	
Total .. . . . .			4,034.23
Grand Total .. . . . .			\$135,904.52



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# REPORT OF THE AGENT OF DOMINION LANDS, R. CRUICKSHANK, PEACE RIVER, ALTA.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Homestead fees .. .. .	671	\$ 6,710.00	
Improvements .. .. .	61	3,302.15	
Land Sales (cash) .. .. .	25	2,036.94	
Searches, etc. .. .. .	14	3.50	
Applications for patent .. .. .	289		
Applications for inspection .. .. .	290		
Entries cancelled .. .. .	948		
Soldier grants .. .. .	188		
Total .. .. .			\$ 12,052.59
<i>Timber and Grazing Branch—</i>			
Timber permits .. .. .	558	\$ 2,925.89	
Timber Seizures .. .. .	1	12.50	
Hay permits .. .. .	420	1,090.90	
Grazing rentals (cash) .. .. .	195	2,165.90	
Totals .. .. .			6,195.19
<i>Forestry Branch—</i>			
Grazing rentals .. .. .	4	\$ 58.10	
Hay dues .. .. .	6	74.00	
Total .. .. .			132.10
<i>Mining Lands and Yukon—</i>			
Coal royalty .. .. .	2	\$ .95	
Mining fees .. .. .	9	45.00	
Petroleum .. .. .	713	60,707.49	
Coal permits .. .. .	15	310.00	
Gravel .. .. .	2	10.00	
Prospecting fees .. .. .	2	4.00	
Total .. .. .			61,077.44
<i>School Lands Branch—</i>			
Timber permits .. .. .	1	\$ 180.25	
Hay permits .. .. .	98	221.80	
Grazing rentals .. .. .	60	1,834.70	
Petroleum .. .. .	44	3,457.13	
Cultivation permits .. .. .	2	10.00	
Total .. .. .			5,703.88
<i>Miscellaneous Revenue—</i>			
Seed grain and provision .. .. .	31	\$ 2,258.93	
Total .. .. .			2,258.93
Grand total .. .. .			87,420.13



SESSIONAL PAPER No. 25

# REPORT OF THE AGENT OF DOMINION LANDS, T. J. WADMAN, REVELSTOKE, B.C.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total
Homestead fees .. .. .	5	\$ 50.00	
Soldier grants .. .. .	9		
Improvements .. .. .	19	1,676.91	
Land sales .. .. .	1	10.00	
Townsite payments .. .. .	9	249.95	
Purchased homestead payments .. .. .	4	115.85	
Searches, etc. .. .. .	18	8.15	
Applications for patent .. .. .	43		
Applications for inspection .. .. .	7		
Entries cancelled .. .. .	19		
Sundries .. .. .	1	35.00	
Total .. .. .			\$ 2,145.86
<i>Timber and Grazing Branch—</i>			
Bonus .. .. .	1	\$ 3,020.52	
Ground rentals .. .. .	86	5,966.85	
Royalties .. .. .	33	16,849.10	
Timber permits .. .. .	181	5,063.10	
Timber seizures .. .. .	1	330.15	
Fire-guarding charges .. .. .	12	2,351.00	
Sundries .. .. .	6	12.69	
Total .. .. .			33,593.11
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. .. .	1	\$ 5.00	
Rental .. .. .	1	21.70	
Total .. .. .			26.70
Grand total .. .. .			\$35,765.67



12 GEORGE V. A. 1922

# REPORT OF THE AGENT OF DOMINION LANDS, M. A. MCINNES, SASKATOON, SASK.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Soldier grants .. .. .	167		
Homestead fees .. .. .	163	\$ 1,630.00	
Improvements .. .. .	68	4,394.55	
Land sales .. .. .	46	4,746.25	
Pre-emption payments .. .. .	95	69,772.64	
Purchased homestead payments .. .. .	80	18,508.16	
Searches, etc. .. .. .	809	214.50	
Applications for patent .. .. .	1,080		
Applications for inspection .. .. .	478		
Entries cancelled .. .. .	341		
Sundries .. .. .	1	2.00	
Total .. .. .			\$99,268.10
<i>Timber and Grazing Branch—</i>			
Timber permits .. .. .	103	\$ 211.70	
Timber seizures .. .. .	1	30.75	
Hay permits .. .. .	604	1,876.91	
Grazing rentals .. .. .	111	389.55	
Sundries .. .. .	3	1.45	
Total .. .. .			2,510.86
<i>Forestry Branch—</i>			
Timber dues .. .. .	2	\$ 4.15	
Permit fees and rental .. .. .	307	1,381.15	
Seizures .. .. .	10	72.35	
Grazing rents, etc. .. .. .	145	2,155.31	
Hay dues .. .. .	156	1,713.50	
Total .. .. .			5,326.46
<i>Mining Lands and Yukon Branch—</i>			
Mining fees .. .. .	57	\$ 669.00	
Rental .. .. .	4	710.98	
Total .. .. .			1,379.98
<i>School Lands Branch—</i>			
General sales .. .. .	4	\$ 4,354.99	
Timber permits .. .. .	7	20.25	
Hay permits .. .. .	774	1,714.80	
Grazing rentals .. .. .	634	18,890.62	
Mining fees .. .. .	1	5.00	
Cultivation permits .. .. .	4	107.50	
Sundries .. .. .	4	2.25	
Total .. .. .			25,095.41
<i>Miscellaneous—</i>			
Seed grain payments .. .. .	318	\$ 61,141.47	
Sundries .. .. .	1	5.00	
Total .. .. .			61,146.47
Grand total .. .. .			\$194,726.78



REPORT OF THE AGENT OF DOMINION LANDS, S. LEE,  
SWIFT CURRENT, SASK.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

Land Patents Branch—	Number.	Revenue.	Total.
Homestead fees .. .. .	227	\$ 2,240.00	
Soldier grants .. .. .	189		
Improvements .. .. .	77	5,382.11	
Land sales (cash) .. .. .	12	1,741.00	
Pre-emption payments .. .. .	804	275,812.62	
Purchased homestead payments .. .. .	62	11,775.62	
Searches, etc. .. .. .	1,090	272.50	
Applications for patent .. .. .	2,598		
Applications for inspection .. .. .	1,574		
Entries cancelled .. .. .	1,052		
Total .. .. .			\$297,223.85
Timber and Grazing Branch—			
Timber permits.. .. .	83	\$ 32.00	
Timber seizures .. .. .	1	8.20	
Hay permits.. .. .	348	595.70	
Grazing rentals (cash) .. .. .	1,589	24,725.72	
Sundries .. .. .	24	43.50	
Total .. .. .			25,405.12
Forestry Branch—			
Permit fees and rental.. .. .	273	\$ 437.30	
Seizures .. .. .	7	78.80	
Grazing rent, etc.. .. .	408	12,709.36	
Hay dues .. .. .	14	57.75	
Sundries .. .. .	2	35.50	
Total .. .. .			13,318.71
Reclamation service—			
Sales .. .. .	1	.25	
Total .. .. .			.25
Mining Lands and Yukon Branch—			
Mining fees.. .. .	65	\$ 325.00	
Rental .. .. .	11	221.15	
Royalty .. .. .	17	267.10	
Coal permits, petroleum and natural gas	49	1,922.75	
Sundries .. .. .	56	802.00	
Total .. .. .			3,538.00
School Lands Branch—			
General sales.. .. .	10	\$ 5,420.70	
Timber permits .. .. .	6	16.00	
Hay permits .. .. .	277	370.50	
Grazing rentals .. .. .	799	31,353.75	
Mining fees .. .. .	5	25.00	
Coal rental, petroleum and natural gas	2	110.00	
Cultivation permits .. .. .	5	465.00	
Sundries .. .. .	5	8.10	
Total .. .. .			37,769.05
Miscellaneous—			
Seed grain and provision payments ..	682	\$ 117,625.02	
Total .. .. .			117,625.02
Grand total .. .. .			\$494,880.00



REPORT OF THE AGENT OF DOMINION LANDS, L. RANKIN,  
WINNIPEG, MAN.

STATEMENT of Business Transacted during the Fiscal Year ending March 31, 1921

<i>Land Patents Branch—</i>	Number.	Revenue.	Total.
Homestead fees .. .. .	667	\$ 3,670.00	
Soldier grants .. .. .	290		
Improvements .. .. .	119	6,583.96	
Land sales (cash) .. .. .	73	5,496.84	
Pre-emption payments .. .. .	2	397.10	
Searches, etc. . . . .	969	330.70	
Sundries. . . . .	2	5.00	
Applications for patent .. .. .	1,222		
Applications for inspection .. .. .	1,161		
Entries cancelled .. .. .	825		
Total .. .. .			\$16,483.60
<i>Timber and Grazing Lands Branch—</i>			
Grazing rentals. . . . .	107	\$ 1,603.11	
Total .. .. .			1,603.11
<i>Mining Lands and Yukon Branch</i>			
Mining fees. . . . .	2,212	\$ 11,054.65	
Quarries .. .. .	43	1,120.54	
Petroleum and natural gas .. .. .	17	1,349.50	
Total .. .. .			13,524.69
<i>School Lands—</i>			
Sales .. .. .	18	\$ 4,678.70	
Hay lease .. .. .	1	40.00	
Grazing rentals .. .. .	209	4,370.44	
Mining fees .. .. .	10	50.00	
Petroleum and natural gas .. .. .	3	253.50	
Cultivation permits .. .. .	6	96.50	
Sundries .. .. .	1	40.00	
Total .. .. .			9,529.14
<i>Miscellaneous—</i>			
Seed grain and relief payments. . . . .		\$ 14,883.59	
Total .. .. .			14,883.59
Grand Total .. .. .			\$56,024.13

REPORT OF MR. N. O. CÔTÉ, CONTROLLER OF THE LAND PATENTS  
BRANCH AND REGISTRAR OF DOMINION LANDS PATENTS

For the fiscal year ended March 31, 1921, with statements in relation thereto, marked A to K, inclusive.

LETTERS PATENT

The number of letters patent issued during the period mentioned was 17,947, covering an area of 2,753,494 acres, which may be classified as follows:—

Province	Patents	Acres
Manitoba. . . . .	2,601	397,426
Saskatchewan. . . . .	8,550	1,338,332
Alberta. . . . .	6,370	979,662
British Columbia. . . . .	376	37,902
Yukon Territory. . . . .	40	70
Northwest Territories. . . . .	10	102
	17,947	2,753,494



## SESSIONAL PAPER No. 25

These grants are given in detail in the statements marked A to G, inclusive, and may be summarized as follows:—

Grants	Patents	Acres
Homesteads.. . . . .	12,329	1,934,922
Sales.. . . . .	1,324	169,026
Pre-emptions.. . . . .	3,350	531,045
Purchased homesteads.. . . . .	406	62,369
Railways.. . . . .	190	10,744
Special or free grants.. . . . .	282	37,166
Northwest half-breeds.. . . . .	3	283
Licenses of occupation.. . . . .	12	26
Soldier grants.. . . . .	49	7,805
Hudson's Bay Company.. . . . .	2	108
	<hr/> 17,947	<hr/> 2,753,494

There was an increase of 215 letters patent and a decrease in the area patented of 35,403 acres, as compared with the previous year.

There are recorded in the Land Patents Branch 433,215 letters patent, aggregating 97,583,419 acres, which have been issued since May, 1873, to March 31, 1921.

## LANDS DISPOSED OF

Five thousand three hundred and eighty-nine homestead entries were granted during the year, aggregating an approximate area of 862,240 acres, made up by provinces as follows:—

Province	Homestead entries	Acres
Manitoba.. . . . .	725	
Saskatchewan.. . . . .	1,670	
Alberta.. . . . .	2,874	
British Columbia.. . . . .	120	
	<hr/> 5,389	<hr/> 862,240

There was a decrease of 1,343 in the number of homestead entries granted, as compared with the previous year.

By land agencies the 5,389 homestead entries are made up as follows:—

<b>Manitoba—</b>	<b>Entries</b>
Dauphin.. . . . .	358
Winnipeg.. . . . .	367
	<hr/> 725
<b>Saskatchewan—</b>	
Battleford.. . . . .	367
Moosejaw.. . . . .	240
Prince Albert.. . . . .	674
Saskatoon.. . . . .	163
Swift Current.. . . . .	226
	<hr/> 1,670
<b>Alberta—</b>	
Calgary.. . . . .	280
Edmonton.. . . . .	1,297
Grande Prairie.. . . . .	548
Lethbridge.. . . . .	78
Peace River.. . . . .	671
	<hr/> 2,874
<b>British Columbia—</b>	
Kamloops.. . . . .	71
New Westminster.. . . . .	44
Revelstoke.. . . . .	5
	<hr/> 120



12 GEORGE V, A. 1921

The 5,389 entrants for homesteads represented 11,256 persons, as compiled from information obtained from each entrant. Of these entries 1,605 were made by residents of the several provinces of the Dominion; three by Canadians who had returned from the United States, and 871 by persons who had previously obtained homestead entries, but which entries had been cancelled by default or at the request of the entrants in order, in most cases, to enter for other lands; 1,177 were made by persons from the British Isles; 1,072 by Americans; 170 by naturalized Austro-Hungarians; 99 by Russians and Finns; 84 by Norwegians; 71 by Swedes; 22 by naturalized Germans; 32 by Frenchmen; 36 by Belgians, and the remaining 147 were made by citizens of various other countries.

There were 2,892 soldier grant entries made during the year, aggregating approximately 462,720 acres, made up by provinces as follows:—

	No. of entries	Acres
Manitoba.. . . . .	475	76,000
Saskatchewan.. . . . .	1,188	190,080
Alberta.. . . . .	1,171	187,360
British Columbia.. . . . .	58	9,280
	2,892	462,720
By land agencies as follows:—		
Manitoba—		
Dauphin.. . . . .	185	
Winnipeg.. . . . .	290	
		475
Saskatchewan—		
Battleford.. . . . .	218	
Moosejaw.. . . . .	153	
Prince Albert.. . . . .	467	
Saskatoon.. . . . .	166	
Swift Current.. . . . .	184	
		1,188
Alberta—		
Calgary.. . . . .	212	
Edmonton.. . . . .	489	
Grande Prairie.. . . . .	209	
Lethbridge.. . . . .	73	
Peace River.. . . . .	188	
		1,171
British Columbia—		
Kamloops.. . . . .	38	
New Westminster.. . . . .	12	
Revelstoke.. . . . .	8	
		58
		2,892

CANCELLED ENTRIES

There were cancelled during the same period 8,185 entries, made up as follows:—

	Manitoba	Saskatche- wan	Alberta	British Columbia
Homesteads.. . . . .	1,403	2,360	3,365	208
Pre-emptions.. . . . .	1	557	232	....
Purchased homesteads.. . . . .	....	24	16	....
Sales.. . . . .	1	9	8	1
Total.. . . . .	1,405	2,950	3,621	209

SALES

Three hundred and seventy-three sales were made during the fiscal year for 15,239.42 acres of land, with an average for each sale of about 40½ acres.



## SESSIONAL PAPER No. 25

## ACCOUNTS AND REVENUE

There are at present kept in this branch about 21,000 individual accounts in connection with purchased homesteads, pre-emptions and ordinary sales.

During the fiscal year \$1,704,412.27, including \$319,491.25 interest on deferred payments, was received on account of purchased homesteads, pre-emptions and ordinary sales, being a decrease of \$1,014,651.45 as compared with the payments received during the previous year.

One hundred and twenty-one thousand, eight hundred and twenty-nine dollars and eighty-nine cents has also been received for entry fees, improvements and sundries, making a total revenue for the fiscal year of \$1,826,242.16.

## REFUNDS

There were 1,668 refunds made, amounting to \$76,324.02, as follows:—

859 refunds—Value of improvements collected on cancelled homesteads.. . . .	\$60,083 12
809 refunds—Overpayments on sales; and of moneys paid on account of purchased homesteads and pre-emption sales, entries for which have been cancelled.. . . .	16,240 90
	<hr/>
	\$76,324 02
	<hr/>

## NEWLY SURVEYED LANDS THROWN OPEN TO HOMESTEAD ENTRY

During the past fiscal year newly surveyed lands comprised in one hundred and thirty-two townships were made available for homestead entry in the following land agencies:—

Dauphin, Man.. . . .	in 12 townships
Winnipeg, Man.. . . .	" 17 "
Battleford, Sask.. . . .	" 2 "
Saskatoon, Sask.. . . .	" 1 "
Prince Albert, Sask.. . . .	" 11 "
Edmonton, Alta.. . . .	" 1 "
Grande Prairie, Alta.. . . .	" 16 "
Grouard, Alta.. . . .	" 12 "
Lethbridge, Alta.. . . .	" 1 "
Peace River, Alta.. . . .	" 27 "
Calgary, Alta.. . . .	" 3 "
Kamloops, B.C.. . . .	" 16 "
Revelstoke, B.C.. . . .	" 10 "
New Westminster, B.C.. . . .	" 3 "



“ A ”

STATEMENT OF LETTERS PATENT covering Dominion Lands situate in Manitoba, Saskatchewan, Alberta, Northwest Territories, British Columbia and the Yukon Territory issued from the Department of the Interior during the Fiscal Year ending March 31, 1920, as compared with the Fiscal Year ending March 31, 1919, and recorded in the Land Patents Branch.

No	Nature of Grant	From April 1, 1920, to March 31, 1921		From April 1, 1919 to March 31, 1920.	
		Patents	Acres	Patents	Acres
1	Alberta Railway and Irrigation Co's sales.....	1	142	3	904
2	British Columbia homesteads.....	156	18,538	128	14,908
3	British Columbia sales.....	9	402	18	481
4	Commutation grants.....			2	134
5	Coal lands sales.....			3	1,652
6	Coal surface sales.....	1	670	2	11
7	Greater Winnipeg Water district.....	1	2		
8	Homesteads, Peace River Block.....	108	16,716	50	7,407
9	Homesteads.....	12,065	1,899,668	10,175	1,651,463
10	Hudson's Bay Co.....	2	108	4	2,392
11	License of occupation.....	12	26	15	918
12	Military Bounty Grants.....	2	318		
13	Mining Lands sales.....	12	612	13	563
14	Mineral rights (1,625 acres).....	5		4	
15	Northwest half-breed grants.....	3	283	3	320
16	Parish sales.....	7	829	3	572
17	Pre-emption sales.....	3,350	531,045	4,883	775,963
18	Purchased homesteads.....	406	62,369	518	80,312
19	Quit claim, sales.....	16	867	20	1,393
20	Quit claim, special grants.....	25	2,057	21	1,674
	Railways—				
21	Alberta and Great Waterways Railway Co..	1	6	21	253
22	Calgary and Edmonton Railway Co.....	1	317	1	155
23	Canadian Northern Alberta Railway Co....	15	153	1	2
24	Canadian Northern Railway Co.....	24	5,313	51	16,350
25	Canadian Northern Pacific Railway.....	12	76		
26	Canadian Northwestern Railway Co.....	3	27		
27	Canadian Pacific Railway grants.....	24	3,026	5	19
28	Canadian Pacific Railway roadbed and sta- tion grounds.....	33	366	30	262
29	Central Canada Railway Co.....	1	11	5	208
30	Edmonton, Dunvegan and British Columbia Railway Co.....	8	87	9	71
31	Grand Trunk Pacific Railway Co.....	8	564	1	9
32	Grand Trunk Pacific Branch Lines Co.....	13	98	23	246
33	Kettle Valley Railway.....	43	665		
34	Manitoba Southwestern Colonization Rail- way Co.....	1	5		
35	Nicola, Kamloops and Similkameen Rail- way Co.....	3	30	23	143
36	Qu'Appelle, Long Lake and Saskatchewan Railroad and Steamboat Co.....			5	717
37	Sales.....	464	26,662	497	33,432
38	Sales, Peace River Block.....	1	81	1	15
39	School lands sales.....	767	138,689	1,103	224,066
40	Soldier grants.....	49	7,805	20	3,137
41	Special grants.....	255	34,791	58	4,270
42	Yukon Territory homesteads.....			2	320
43	Yukon Territory sales.....	40	70	11	155
	Totals.....	17,947	2,753,494	17,732	2,788,897



## SESSIONAL PAPER No. 25

## "B"

STATEMENT OF LETTERS PATENT covering Dominion Lands situate in the Province of Manitoba, issued from the Department of the Interior during the Fiscal Year ending March 31, 1921, as compared with the Fiscal Year ending March 31, 1920, and recorded in the Land Patents Branch.

No.	Nature of Grant	From April 1, 1920, to March 31, 1921		From April 1, 1919, to March 31, 1920	
		Patents	Acres	Patents	Acres
1	Commutation grants.....			2	134
2	Greater Winnipeg Water District.....	1	2		
3	Homesteads.....	2,249	352,465	1,683	264,103
4	Hudson's Bay Co.....			1	6
5	Military Bounty grants.....	1	160		
6	Mining Lands sales.....	12	612	13	563
7	Parish sales.....	6	777	3	372
8	Pre-emption sales.....	3	336	2	354
9	Quit claim, special grants.....	2	80	1	
10	Quit claim, sales.....			6	470
	Railways—				
11	Canadian Northern Railway Co.....	6	73	5	335
12	Canadian Pacific Railway grants.....	1	24		
13	Canadian Pacific Railway roadbed and station grounds.....	1	2	18	158
14	Manitoba Southwestern Colonization Railway Co.....	1	5		
15	Sales.....	80	4,229	51	2,170
16	School lands sales.....	194	33,172	236	48,234
17	Special grants.....	44	5,489	9	401
	Totals.....	2,601	397,426	2,030	317,500

## "C"

STATEMENT OF LETTERS PATENT covering Dominion Lands situate in the Province of Saskatchewan, issued from the Department of the Interior during the Fiscal Year ending March 31, 1921, as compared with the Fiscal Year ending March 31, 1920, and recorded in the Land Patents Branch.

No.	Nature of Grant	From April 1, 1920, to March 31, 1921		From April 1, 1919, to March 31, 1920	
		Patents	Acres	Patents	Acres
1	Homesteads.....	5,227	823,931	4,714	740,803
2	Hudson's Bay Co.....			2	1,732
3	License of occupation.....	3	7	3	10
4	Northwest half-breed grants.....	1	48	3	320
5	Per-emption sales.....	2,279	361,561	3,677	584,557
6	Purchased homesteads.....	284	44,204	365	56,756
7	Quit claim, sales.....	12	612	13	774
8	Quit claim, special grants.....	16	1,577	16	1,593
	Railways—				
9	Canadian Northern Railway Co.....	16	5,231	46	16,015
10	Canadian Pacific Railway grants.....	19	2,967	2	18
11	Canadian Pacific Railway roadbed and station grounds.....	2	56		
12	Edmonton, Dunvegan and British Columbia Railway Co.....	6	86		
13	Grand Trunk Pacific Railway Co.....	1		1	9
14	Grand Trunk Pacific Branch Lines Co.....	2	3	1	6
15	Qu'Appelle, Long Lake and Saskatchewan railroad and Steamboat Co.....			5	717
16	Sales.....	194	12,518	242	21,541
17	School lands sales.....	402	74,417	571	114,306
18	Soldier grants.....	32	5,090	16	1,496
19	Special grants.....	54	6,024	24	2,443
	Totals.....	8,550	1,338,332	9,701	1,544,096



“D”

STATEMENT OF LETTERS PATENT covering Dominion Lands situate in the Province of Alberta issued from the Department of the Interior during the Fiscal Year ending March 31, 1921, as compared with the Fiscal Year ending March 31, 1920, and recorded in the Land Patents Branch.

No.	Nature of Grant	From April 1, 1920, to March 31, 1921		From April 1, 1919, to March 31, 1920	
		Patents	Acres	Patents	Acres
1	Alberta Railway and Irrigation Co.'s sales.....	1	142	3	904
2	Coal lands sales.....			3	1,652
3	Coal surface sales.....	1	670	2	11
4	Homesteads.....	4,589	723,272	3,778	610,557
5	Hudson's Bay Co.....	2	108	1	654
6	License of occupation.....	9	19	12	908
7	Military bounty grants.....	1	158		
8	Mineral rights (1,625 acres).....	5		4	
9	Northwest half-breed grants.....	2	235		
10	Pre-emption sales.....	1,068	169,148	1,204	191,052
11	Purchased homesteads.....	117	18,095	150	23,495
12	Quit claim, sales.....	4	255	1	149
13	Quit claim, special grants.....	7	400	3	72
	Railways:				
14	Alberta and Great Waterways Railway Co....	1	6	21	253
15	Calgary and Edmonton Railway Co.....	1	317	1	155
16	Canadian Northern Railway Co.....	2	9		
17	Canadian Northern Alberta Railway Co.....	15	153	1	2
18	Canadian Northwestern Railway Co.....	3	27		
19	Canadian Pacific Railway grants.....	3	23	3	1
20	Canadian Pacific Railway roadbed and station grounds.....	1	9	1	7
21	Central Canada Railway Co.....	1	11	5	208
22	Edmonton, Dunvegan and British Columbia Railway Co.....	2	1	9	71
23	Grand Trunk Pacific Railway Co.....	7	564		
24	Grand Trunk Pacific Branch Lines Co.....	11	95	22	240
25	Sales.....	180	9,813	200	9,658
26	School lands sales.....	171	31,100	296	61,526
27	Soldier grants.....	17	2,715	4	641
28	Special grants.....	149	22,317	21	1,090
	Totals.....	6,370	979,662	5,745	903,306



## SESSIONAL PAPER No. 25

## "E"

STATEMENT OF LETTERS PATENT covering Dominion Lands situate in the Province of British Columbia, issued from the Department of the Interior during the Fiscal Year ending March 31, 1921, as compared with the Fiscal Year ending March 31, 1920, and recorded in the Land Patents Branch.

No.	Nature of Grant	From April 1, 1920, to March 31, 1921		From April 1, 1919, to March 31, 1920	
		Patents	Acres	Patents	Acres
1	British Columbia homesteads.....	156	18,538	128	14,908
2	British Columbia sales.....	9	402	18	481
3	Homesteads, Peace River Block.....	108	16,716	50	7,407
4	Parish sales.....	1	52		
5	Purchased homesteads.....	5	70	3	61
6	Quit claim, special grants.....			1	9
	Railways.....				
7	Canadian Pacific Railway grants.....	1	12		
8	Canadian Pacific Railway roadbed and station grounds.....	29	299	11	97
9	Canadian Northern Pacific Railway Co.....	12	76		
10	Kettle Valley Railway.....	43	665		
11	Nicola, Kamloops and Shuswap Railway Co.....	3	30	23	143
12	Sales, Peace River Block.....	1	81	1	15
13	Special grants.....	8	961	3	183
	Totals.....	376	37,902	238	23,304

## "F"

STATEMENT OF LETTERS PATENT covering Dominion Lands situate in the Yukon Territory, issued from the Department of the Interior during the Fiscal Year ending March 31, 1921, as compared with the Fiscal Year ending March 31, 1920, and recorded in the Land Patents Branch.

No.	Nature of Grant	From April 1, 1920, to March 31, 1921		From April 1, 1919, to March 31, 1920	
		Patents	Acres	Patents	Acres
1	Yukon Territory homesteads.....			2	320
2	Yukon Territory sales.....	40	70	11	155
	Totals.....	40	70	13	475

## "G"

STATEMENT OF LETTERS PATENT covering Dominion Lands situate in the Northwest Territories, issued from the Department of the Interior during the Fiscal Year ending March 31, 1921, as compared with the Fiscal Year ending March 31, 1920, and recorded in the Land Patents Branch.

No.	Nature of Grant	From April 1, 1920, to March 31, 1921		From April 1, 1919, to March 31, 1920	
		Patents	Acres	Patents	Acres
1	Sales.....	10	102	4	63
2	Special grants.....			1	153
	Totals.....	10	102	5	216



“H”

STATEMENT showing the number of Homestead Entries made during the Fiscal Year, 1920 and 1921, the Nationality of the Homesteaders and the Provinces in which the entries were made.

Nationalities	Provinces				Total
	Manitoba	Saskat- chewan	Alberta	British Columbia	
Canadians from Ontario.....	76	287	292	10	665
“ Quebec.....	36	83	150	1	270
“ Nova Scotia.....	7	26	40	5	78
“ New Brunswick.....	6	7	38	1	52
“ Prince Edward Island.....	3	11	21	2	37
“ Manitoba.....	128	61	44	4	237
“ Saskatchewan.....	14	67	24		105
“ Alberta.....	2	10	120	2	134
“ British Columbia.....			20	7	27
Persons who had previous entry.....	97	250	511	13	871
Newfoundlanders.....	1		7		8
Canadians returned from the United States.....			3		3
Americans.....	49	292	721	10	1,072
English.....	134	256	398	33	821
Scotch.....	42	80	107	13	242
Irish.....	18	29	60	7	114
French.....	6	11	15		32
Belgians.....	11	13	11	1	36
Swiss.....	1	3	14		18
Italians.....		4	14	1	19
Roumanians.....		6	5	1	12
Syrians.....			1		1
Germans.....	1	7	14		22
Austro-Hungarians.....	32	52	84	2	170
Hollanders.....	1	3	5		9
Danes (other than Icelanders).....	8	12	26		46
Icelanders.....	13	1			14
Swedes.....	6	20	40	5	71
Norwegians.....	7	34	42	1	84
Russians (other than Finns).....	12	40	38	1	91
Finns.....	8				8
Serbians.....					
Bulgarians.....					
Chinese.....					
Japanese.....					
Persians.....					
Australians.....					
New Zealanders.....					
Hindoos.....					
Hebrews.....					
Greeks.....	1		1		2
Poles.....	4	5	3		12
South African.....	1				1
Australian.....			2		2
New Zealand.....			1		1
Brazilian.....			1		1
South American.....			1		1
Total.....	725	1,670	2,874	120	5,389

Number of souls represented by above entries, 11,256.



## SESSIONAL PAPER No. 25

## "I"

STATEMENT showing the number of Homestead Entries made in the Provinces of Manitoba, Saskatchewan, Alberta and British Columbia during the Fiscal Year ending March 31, 1921, by persons coming from the United States of America.

States	Provinces				Total
	Manitoba	Saskatchewan	Alberta	British Columbia	
Alabama			1		1
Alaska					
Arizona					
Arkansas		1	4		5
California	1		9		10
Carolina, North			4		4
Carolina, South			1		1
Colorado	1		6		7
Columbia, District of					
Connecticut			1		1
Dakota, North	6	45	50	3	104
Dakota, South	1	21	26		48
Delaware					
Florida			1		1
Georgia			1		1
Idaho		6	14		20
Illinois	2	16	27	1	46
Indiana	1	9	27		37
Indian Territory					
Iowa	2	13	53		68
Kansas		9	24		33
Kentucky		1	5		6
Louisiana	1	1			2
Maine			5		5
Maryland		3	2		5
Massachusetts	2	7	15	1	25
Michigan	8	15	56		79
Minnesota	6	53	88		147
Mississippi					
Missouri	1	7	38		46
Montana	2	6	29		37
Nebraska	1	11	23		35
Nevada			1		1
New Hampshire		1	4		5
New Jersey			3		3
New Mexico			1		1
New York	5	12	31		48
Ohio		5	23		28
Oklahoma	1	7	13		21
Oregon	1	2	9		12
Pennsylvania	2	2	20		24
Rhode Island		3	4		7
Tennessee	1	2	3		6
Texas	1	3	15		19
Utah			4		4
Vermont		2	1		3
Virginia			3		3
Virginia, West			8		8
Washington	1	4	28	2	35
Wisconsin	2	23	39	3	37
Wyoming			3		6
Total	49	290	723	10	1,072



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## "J"

STATEMENT showing the number of Homestead Entries made during the Fiscal Year ending March 31, 1921, as compared with Fiscal Year ending March 31, 1920.

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1920-21	1919-20	1920-21	1919-20	1920-21	1919-20	1920-21	1919-20	
Battleford			367	351					
Calgary					280	309			
Dauphin	358	723							
Edmonton					1,297	1,416			
Grand Prairie.....					548	824			
Kamloops.....							71	82	
Lethbridge					78	120			
Moose Jaw			240	228					
New Westminster.							44	44	
Peace River.....					671	779			
Prince Albert.....			674	922					
Revelstoke.....							5	8	
Saskatoon.....			163	204					
Swift Current.....			226	213					
Winnipeg.....	367	509							
Fiscal year 1920-21									5,389
Fiscal year 1919-20.									6,732
Total.	725	1,232	1,670	1,918	2,874	3,448	120	134	

## RECAPITULATION

Month	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1920-21	1919-20	1920-21	1919-20	1920-21	1919-20	1920-21	1919-20	
April.....	90	116	130	198	192	365	11	7	
May	59	99	144	227	316	395	11	14	
June	86	175	207	186	356	459	10	12	
July.....	83	186	253	249	332	448	11	13	
August	64	92	191	177	297	492	13	7	
September....	61	116	129	175	254	328	10	13	
October.....	73	131	123	181	271	290	7	12	
November....	61	74	151	114	237	159	4	9	
December....	45	70	114	127	214	147	10	14	
January.....	32	35	77	92	124	102	4	12	
February.....	27	57	79	88	120	97	11	10	
March.....	44	81	72	104	161	126	18	11	
Total.....	725	1,232	1,670	1,918	1,874	3,448	120	134	



## SESSIONAL PAPER No. 25

## "K"

STATEMENT showing the number of Soldier Grant Entries made during the Fiscal Year ending March 31, 1921, as compared with Fiscal Year ending March 31, 1920.

Agency	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1920-21	1919-20	1920-21	1919-20	1920-21	1919-20	1920-21	1919-20	
Battleford			218	168					
Calgary					212	333			
Dauphin	185	467							
Edmonton					489	1,179			
Grand Prairie					209	590			
Kamloops							38	72	
Lethbridge					73	114			
Moose Jaw.....			153	241					
New Westminster							12	35	
Peace River					188	523			
Prince Albert			467	1,122					
Revelstoke							8	10	
Saskatoon			166	272					
Swift Current			184	193					
Winnipeg	290	662							
Fiscal year 1920-21.....									2,892
Fiscal year 1919-20									5,981
Total.....	475	1,129	1,188	1,996	1,171	2,739	58	117	

## RECAPITULATION

Month	Manitoba		Saskatchewan		Alberta		British Columbia		Total
	1920-21	1919-20	1920-21	1919-20	1920-21	1919-20	1920-21	1920-21	
April.....	56	92	127	47	144	201	4	9	
May	56	101	120	130	155	216	8	13	
June....	65	168	162	264	138	345	10	15	
July.....	60	204	191	292	109	393	5	10	
August.....	36	89	120	212	118	369	2	9	
September.....	44	117	86	220	90	271	4	9	
October.....	35	106	87	214	93	291	5	12	
November.	26	54	88	138	96	185	4	5	
December.....	33	51	65	147	77	152	5	8	
January. . .	26	50	49	109	51	94	0	9	
February.....	13	41	39	102	41	84	5	2	
March.....	25	56	54	121	56	135	6	16	
Total.....	475	1,129	1,188	1,996	1,171	2,739	58	117	



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SCHOOL LANDS DIVISION—W. T. ROLLINS

ANNUAL REPORT of School Lands Branch, Department of the Interior, for the Fiscal Year, ending March 31, 1921.

School lands were disposed of by sale in the provinces of Manitoba, Saskatchewan and Alberta as follows:—

MANITOBA			
How Disposed of	Area Acres	Value	Average Per acre
Soldier Settlement Board.. .. .	10,424.01	\$130,487 97	\$12 52
Railway companies.. .. .	25.54	357 45	14 00
School sites.. .. .	13.	130 00	10 00
Total.. .. .	10,462.55	\$130,975 42	\$12 51

SASKATCHEWAN			
How Disposed of	Area Acres	Value	Average Per acre
Soldier Settlement Board.. .. .	84,163.22	\$1,229,162 31	\$14 60
Special to lessees of mining rights..	166.92	3,813 00	22 85
Railway companies.. .. .	43.38	754 68	17 40
School sites.. .. .	31.25	327 70	10 49
Total.. .. .	84,404.77	\$1,234,057 69	\$14 62

ALBERTA			
How Disposed of	Area Acres	Value	Average Per acre
Public auction.. .. .	115,768.55	\$2,063,021 27	\$17 82
Soldier Settlement Board.. .. .	6,695.70	102,018 00	15 24
Railway companies.. .. .	39.19	462 78	11 81
Total.. .. .	122,536.44	\$2,165,850 05	\$17 67

The approximate net area disposed of to March 31, 1921, after making deductions for cancelled sales, etc., was as follows:—

Province	Area Acres	Value	Average Per acre
Manitoba.. .. .	668,025.35	\$ 6,441,699 30	\$ 9 64
Saskatchewan.. .. .	1,508,539.96	27,135,966 84	17 99
Alberta.. .. .	973,131.59	13,461,461 41	13 83

The value of town lots disposed of to March 31, 1921, was as follows:—

Manitoba.. .. .	\$ 4,808 49
Saskatchewan.. .. .	12,659 00
Alberta.. .. .	41,436 00

The number of permits and leases issued, the number of leases in good standing and the combined revenue derived therefrom for the three provinces to March 31, 1921, was as follows:—

	Permits issued	Leases issued	Leases in good standing	Revenue derived
Grazing.. .. .	5,648	....	....	\$181,877 12
Coal.. .. .	....	7	82	39,375 35
Petroleum and gas.. .. .	....	10	313	33,442 53
Hay.. .. .	5,288	6	25	9,307 81
Cultivation.. .. .	44	....	....	2,025 15
Timber.. .. .	224	....	....	9,361 77
Special.. .. .	....	6	17	1,179 41

Registration Fees.—The revenue derived for the registration of 581 assignments for the three provinces amounted to \$1,175.75.



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The total net revenue collected for the fiscal year was as follows:—

Manitoba.. . . . .	\$ 408,349 99
Saskatchewan.. . . . .	2,830,172 05
Alberta.. . . . .	1,204,723 23
Total.. . . . .	<u>\$4,443,245 27</u>

The revenue collected for the fiscal year, less principal moneys and less expenditure, was paid over to the Governments of the provinces of Manitoba, Saskatchewan and Alberta, as follows:—

## Manitoba—

Revenue other than principal moneys.. . . . .	\$92,585 77
Less expenditure.. . . . .	15,874 61
Amount paid to province.. . . . .	<u>\$76,711 36</u>

## Saskatchewan—

Revenue other than principal moneys.. . . . .	\$675,599 39
Less expenditure.. . . . .	47,967 94
Amount paid to province.. . . . .	<u>\$627,631 45</u>

## Alberta—

Revenue other than principal moneys.. . . . .	\$376,766 39
Less expenditure.. . . . .	38,504 76
Amount paid to province.. . . . .	<u>\$338,261 63</u>

The balance standing to the credit of the School Lands Fund for each province as on March 31, 1921, was as follows:—

## Manitoba—

Total amount at credit of fund.. . . . .	\$5,497,538 31
Amount invested in debenture stock.. . . . .	5,497,000 00
Balance at credit of fund.. . . . .	<u>\$538 31</u>

## Saskatchewan—

Total amount at credit of fund.. . . . .	\$10,985,410 99
Amount invested in debenture stock.. . . . .	10,984,000 00
Balance at credit of fund.. . . . .	<u>\$1,410 99</u>

## Alberta—

Total amount at credit of fund.. . . . .	\$6,159,146 38
Amount invested in debenture stock.. . . . .	6,159,000 00
Balance at credit of fund.. . . . .	<u>\$146 38</u>

Statements herewith lettered "A," "B" and "C," respectively, show the revenue collected from each of the provinces of Manitoba, Saskatchewan and Alberta duly classified.

Statements herewith lettered "D," "E" and "F," respectively, show the balance standing to the credit of the School Lands Fund for each province as on March 31, 1921, after deducting amounts invested in Dominion of Canada debenture stock as provided for by Order in Council dated December 1, 1919.



“A”  
MANITOBA SCHOOL LANDS  
STATEMENT of Revenue collected from School Lands (for Fiscal Year) from April 1, 1920, to March 31, 1921, both dates inclusive.

	Principal	Interest	Total	Cultiva- tion	Grazing	Timber	Hay	Petroleum and Nat- ural gas	Registra- tion fees	Miscel- laneous	Total
Total.....	\$ 316,212 93	\$ cts. 76,507 86	\$ cts. 392,720 79	\$ cts. 635 00	\$ cts. 6,716 25	\$ cts. 5,708 11	\$ cts. 3,510 06	\$ cts. 935 17	\$ cts. 147 50	\$ cts. 58 00	\$ cts. 410,283 38
Registration fees transferred from Dominion Lands .....									147 50		147 50
Total.....	316,212 93	76,507 86	392,720 79	635 00	6,716 25	5,708 11	3,510 06	935 17	147 50	58 00	410,430 88
Office fees transferred to Dominion Lands.....						30 50	627 50				658 00
Total.....	316,212 93	76,507 86	392,720 79	635 00	6,716 25	5,677 61	2,882 56	935 17	147 50	58 00	409,772 88
Refunds.....	448 91	54 04	502 95	87 50	630 84	28 25	162 35	10 00	.....	1 00	1,422 89
Total.....	315,764 02	76,453 82	392,217 84	547 50	6,085 41	5,649 36	2,720 21	925 17	147 50	57 00	408,349 99

“B”  
SASKATCHEWAN SCHOOL LANDS  
STATEMENT of Revenue collected from School Lands (for Fiscal Year) from April 1, 1920, to March 31, 1921, both dates inclusive.

	Principal	Interest	Total	Cultiva- tion	Grazing Rent	Timber	Hay	Coal	Petroleum and Nat- ural gas	Registra- tion fees	Miscel- laneous	Total
Total.....	\$ 2,169,696 63	\$ cts. 562,902 12	\$ cts. 2,732,598 75	\$ cts. 1,136 67	\$ cts. 104,922 86	\$ cts. 1,132 18	\$ cts. 5,557 25	\$ cts. 4,056 42	\$ cts. 1,576 17	\$ cts. 2 00	\$ cts. 1,078 63	\$ cts. 2,852,060 91
Registration fees trans- ferred from Dominion Lands.....										504 50		504 50
Total.....	2,169,696 63	562,902 12	2,732,598 75	1,136 67	104,922 86	1,132 18	5,557 25	4,056 42	1,576 17	506 50	1,078 63	2,852,565 41
Office fees transferred to Dominion Lands.....						14 00	1,293 50					1,307 50
Total.....	2,169,696 63	562,902 12	2,732,598 75	1,136 67	104,922 86	1,118 18	4,263 75	4,056 42	1,576 17	506 50	1,078 63	2,851,257 91
Refunds.....	15,123 97	1,475 19	16,599 16		4,207 22	58 45	121 03		100 00			21,085 86
Total.....	2,154,572 66	561,426 93	2,715,999 59	1,136 65	100,715 64	1,059 73	4,142 72	4,056 42	1,476 17	506 50	1,078 63	2,830,172 05



“C”

ALBERTA SCHOOL LANDS

STATEMENT of Revenue collected from School Lands (for Fiscal Year) from April 1, 1920, to March 31, 1921, both dates inclusive.

—	Principal	Interest	Total	Cultiva- tion	Grazing Rent	Timber	Hay	Coal	Petroleum and Nat- ural gas	Registra- tion fees	Miscel- laneous	Total
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Total. Registration fees trans- ferred from Dominion Lands.....	832,498 12	229,461 60	1,061,959 72	403 50	81,715 49	3,286 71	3,492 08	36,012 18	32,429 27	14 00	151 68	1,219,464 63
Total. Office fees transferred to Dominion Lands	832,498 12	229,461 60	1,061,959 72	403 50	81,715 49	3,286 71	3,492 08	36,012 18	32,429 27	509 75	151 68	1,219,974 38
Total. Refunds...	4,541 28	232 14	4,773 42	62 50	6,639 42	622 55	324 20	693 27	1,388 08	2 00	11 25	14,516 65
Total.....	827,956 84	229,229 46	1,057,186 30	341 00	75,076 07	2,652 68	2,444 88	35,318 93	31,041 19	521 75	140 43	1,204,723 23



" D "

MANITOBA SCHOOL LANDS

STATEMENT of Revenue and Expenditure on Account of Manitoba School Lands for the Fiscal Year Ended March 31, 1921

Particulars	Period	Dr.	Cr.
		\$ cts.	\$ cts.
By balance on April 1, 1920.....	12 months ended March 31, 1921.		774 29
" sales.....			392,217 84
" cultivation permits.....			547 50
" timber dues, hay permits, grazing rental, coal, petroleum and miscellaneous.....			15,437 15
" registration fees.....			147 50
" interest on fund.....	" " "		2,151 03
To cost of management at Ottawa.....	" " "	9,485 55	
" salaries, printing, advertising and general expenses.....	" " "	6,389 06	
" revenue and interest paid to Manitoba Government.....	" " "	76,711 36	
" interest on fund paid to Manitoba Government.....	" " "	2,151 03	
" investments in 5 per cent debenture bonds.....	" " "	316,000 00	
" balance, March 31, 1921.....	" " "	538 31	
		411,275 31	411,275 31

NOTE.—Balance at credit of Manitoba School Lands Fund on March 31, 1921, was \$5,497,538 31, of which \$5,497,000 is invested in 5 p.c. Dominion of Canada debenture stock maturing October 1, 1922, as per Order in Council of December 1, 1919. Interest paid on investments for fiscal year 1920-1921 totalled \$263,625.



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" E "

## SASKATCHEWAN SCHOOL LANDS

STATEMENT of Revenue and Expenditure on Account of Saskatchewan School Lands  
for the Fiscal Year Ended March 31, 1921

Particulars	Period	Dr.	Cr.
		\$ cts.	\$ cts.
By balance on April 1, 1920.....			838 33
" sales .....	12 months ended March 31, 1921.		2,715,999 59
" cultivation permits.....	" " "		1,136 65
" timber dues, hay permits, grazing rentals, coal, petroleum and miscel- laneous.....	" " "		112,529 31
" registration fees.....	" " "		506 50
" interest on fund.....	" " "		10,205 89
To cost of management at Ottawa.....	" " "	28,456 64	
" salaries, printing, advertising and gen- eral expenses.....	" " "	19,511 30	
" revenue and interest paid to Saskat- chewan Government.....	" " "	627,631 45	
" interest on fund paid to Saskatchewan Government.....	" " "	10,205 89	
" investments in 5 p.c. debenture bonds.	" " "	2,154,000 00	
" balance, March 31, 1921 .....	" " "	1,410 99	
		2,841,216 27	2,841,216 27

NOTE.—Balances at credit of Saskatchewan School Lands Fund on March 31, 1921, was \$10,985,410.99, of which \$10,984,000 is invested in 5 p.c. debenture stock maturing October 1, 1922, as per Order in Council of December 1, 1919. Interest paid on investments for fiscal year 1920-21 totalled \$473,075.



“ F ”

ALBERTA SCHOOL LANDS

STATEMENT of Revenue and Expenditure on Account of Alberta School Lands for the Fiscal Year Ended March 31, 1921

Particulars	Period	Dr.	Cr.
		\$ cts.	\$ cts.
By balance on April 1, 1920.....	12 months ended March 31, 1921.		189 54
“ sales.....			1,057,186 30
“ cultivation permits ..			341 00
“ timber dues, hay permits, grazing rentals, coal, petroleum, and miscellaneous.....			146,674 18
“ registration fees.....			521 75
“ interest on fund.....			5,614 21
To cost of management at Ottawa.....		18,971 09	
“ salaries, printing, advertising and general expenses.....		19,533 67	
“ revenue and interest paid to Alberta Government.....		338,261 63	
“ interest on fund paid to Alberta Government.....		5,614 21	
“ investments in debenture bonds.....		828,000 00	
“ balance, March 31, 1921.....		146 38	
		1,210,526 98	1,210,526 98

NOTE.—Balance at credit of Alberta School Lands Fund on March 31, 1921, was \$6,159,146.38, of which \$6,159,000 is invested in 5 p.c. Dominion of Canada debenture stock, maturing October 1, 1922, as per Order in Council of December 1, 1919. Interest paid on investments for fiscal year 1920-21 totalled \$275,950.

REPORT OF THE MINING LANDS AND YUKON BRANCH FOR THE YEAR WHICH ENDED MARCH 31, 1921—H. H. ROWATT

The total revenue of this branch derived from all sources during the fiscal year amounts to \$1,215,156.11, being an increase of \$336,408.88 over the previous year. The increase in revenue is principally due to the number of petroleum and natural gas leases issued at higher rental.

Statements lettered “ A ” and “ B. ” showing in different forms how the revenue is made up, will be found at the end of this report. The statement lettered “ A ” shows the total revenue, and the statement lettered “ B ” shows the revenue collected at each agency, including the Yukon Territory.

The revenue from the Yukon Territory for the year amounts to \$91,036.13.

The reports and statements for the fiscal year from the Gold Commissioner and the Crown Timber and Land Agent at Dawson, in the Yukon Territory, also the report of the Inspecting Engineer of Mines, are herewith submitted.

PETROLEUM AND NATURAL GAS

There are now in force under the regulations, 6,033 petroleum and natural gas leases, embracing a total area of 2,207,065.24 acres, distributed as follows: In Manitoba, 306 leases, comprising 54,760.90 acres; in Saskatchewan, 221 leases, comprising 128,841.90 acres; in Alberta, 4,196 leases, comprising 1,675,693.43 acres; in British Columbia, 1,134 leases, comprising 207,765.03 acres; and in the Northwest Territories, 176 leases, comprising 140,003.98 acres. The total revenue derived from petroleum lands during the year amounts to \$622,146.07.



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Natural gas has been discovered and is now being utilized for commercial and domestic purposes in different parts of the province of Alberta. Oil has been discovered in large quantities in the Northwest Territories, and in smaller quantities in different parts of Alberta. Boring operations are being carried on throughout Alberta and in Saskatchewan, Manitoba and the Northwest Territories.

At a point about forty miles north of Fort Norman, in the Provisional District of Mackenzie, oil in quantity is reported to have been discovered in August, 1920, at a depth of 783 feet in the first well drilled in the Northwest Territories. As the formation in which the oil is reported to have been discovered underlies a very considerable portion of the Mackenzie Basin it is anticipated that the development of an oil-field of considerable extent will result from this discovery.

As the presence of oil in commercial quantity in the Northwest Territories appeared to have been established through this discovery it was considered advisable to rescind the petroleum and natural gas regulations in force, in so far as the said territories are concerned, and to introduce new regulations for the disposal of such rights more directly applicable to a proven field.

The staff of technical officers, with headquarters at Calgary, has been furnished with all appliances necessary to close wells which have gotten beyond the control of the operator, and reference is made to the work of this staff in the report of the inspecting engineer.

## COAL MINING LANDS

The regulations authorizing the sale of coal mining lands have been rescinded and all sales made previous to the withdrawal of the regulations have been completed. The total amount of revenue received on this account was \$2,108,665.79.

## COAL LEASES

The total number of coal mining leases in force at the close of the fiscal year was 682, including a total of 316,355.49 acres, distributed as follows: In Alberta, 590 leases, comprising 298,661.02 acres; in Saskatchewan, 89 leases, comprising 15,411.17 acres; in British Columbia, two leases, comprising 2,240 acres; and in the Yukon Territory, one lease, comprising 40 acres.

The total number of leases of coal mining rights issued during the year was 156, comprising 60,263.91 acres. The total revenue received during the year for rental of coal-mining rights was \$256,420.07.



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ROYALTY ON COAL

Under the regulations governing the issue of leases to mine coal, the royalty is fixed at five cents per ton of 2,000 pounds on the merchantable output of the mine. The following is a statement showing the amount collected on account of royalty on coal mined from lands in the western provinces, the Northwest Territories and the Yukon Territory, respectively, during each year since the regulations came into effect:—

Year	Alberta	Saskatchewan	British Columbia	Yukon	Northwest Territories
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1903-04	56 90	Nil.	Nil.	22 40	Nil.
1904-05	2,822 00	110 70	"	47 00	"
1905-06	2,379 75	47 10	"	569 33	"
1906-07	3,865 26	74 20	"	517 34	"
1907-08	7,621 67	4 30	"	1,543 38	"
1908-09	5,322 39	358 11	"	371 73	"
1909-10	153,559 98	1,672 50	3 00	136 38	"
1910-11	218,932 88	2,184 74	3 50	125 00	"
1911-12	104,894 55	2,034 74	2 78	390 00	"
1912-13	142,997 79	3,145 72	6 95	1,069 11	"
1913-14	147,198 75	2,123 43	19 35	Nil.	"
1914-15	104,489 77	1,880 06	4 90	"	"
1915-16	67,190 17	2,601 52	3 50	"	5 10
1916-17	149,447 82	2,228 08	8 92	"	Nil.
1917-18	144,634 75	4,046 55	Nil.	"	6 00
1918-19	175,687 66	3,193 05	"	"	Nil.
1919-20	181,641 80	2,573 32	"	"	"
1920-21	190,545 80	2,703 41	"	"	"

By an Order in Council dated March 16, 1918, provision was made that, owing to the scarcity of fuel in the Yukon Territory, no royalty shall be levied or collected on coal mined in that territory for a period of five years; that is, up to April 7, 1923.

The total amount derived from coal mining lands on account of purchase price, rental, royalty and application fees, during the fiscal year, amounted to \$456,888.09.

QUARTZ AND PLACER MINING LANDS

During the fiscal year 1,365 entries for quartz mining claims were granted by the mining recorders in Manitoba, Saskatchewan and Alberta, and by the mining recorder for unorganized districts. The total revenue from rentals of quartz mining leases and fees in connection with mineral claims was \$30,110.80.

According to the returns from the Yukon Territory during the fiscal year, 30 entries for placer mining claims, 666 entries for quartz mining claims, and 2,973 renewals and relocations were recorded. The revenue collected from these sources and from fees for registering documents in connection with mining properties was \$37,185.28.

QUARRYING

The number of leases now in force, issued under the provisions of the regulations, is 248, distributed as follows: In Manitoba, 91 leases, comprising 2,785.77 acres; in Saskatchewan, 28 leases, comprising 845.77 acres; in Alberta, 92 leases, comprising 4,163.01 acres; and in British Columbia, 37 leases, comprising 937.34 acres. There are four clay leases in Alberta, comprising 101.26 acres, and five in Saskatchewan, comprising 131.65 acres.

The total revenue collected during the fiscal year on account of quarrying and clay leases, including the application fees, amounts to \$10,330.63.



## SESSIONAL PAPER No. 25

## ROYALTY AND GOLD MINED IN THE YUKON TERRITORY

The total amount collected up to March 31, 1921, for royalty on gold, the output of placer mining claims in the Yukon Territory, after deducting the exemption at one time allowed under the regulations, was \$4,786,072.59, of which amount \$31,273.76 was collected during the last fiscal year. For the purpose of estimating this royalty, the gold is valued at \$15 an ounce, which is much below its real value.

The actual value of gold produced from placer mining operations in the Yukon Territory, up to March 31 last, might be safely placed at \$158,565,000.

## DREDGING

Twelve leases to dredge for minerals in the beds of rivers in the Yukon Territory are now in force, covering a total frontage of 53 miles. The total revenue derived from this source up to March 31, 1921, amounts to \$201,218.82, of which amount \$394.55 was collected during the fiscal year just closed.

These dredging leases are confined to the Yukon, Fortymile and Klondike rivers.

There are in operation in the Yukon Territory six dredges. These dredges are working on the Klondike river and tributaries, also on tributaries of the Indian river, and are operated by hydro-electric motive power. Two of the largest gold-saving dredges in the world are being operated most successfully on the Klondike river-flat.

Thirty-two leases to dredge for minerals in the submerged beds of rivers in the provinces of Alberta, Saskatchewan and Manitoba are now in force, covering a total frontage of 37 miles. Of these leases, five are in Alberta and include 25 miles, one is in Saskatchewan and includes seven miles, and one is in Manitoba and includes five miles. The total revenue derived from this source up to March 31, 1921, amounts to \$48,695.47, of which amount \$968.34 was collected during the past fiscal year.

## HYDRAULIC MINING

The Hydraulic Mining Regulations relating to the Yukon Territory were rescinded by an Order in Council dated February 2, 1904, but leases already granted were not affected by such withdrawal.

There are still in force in the Yukon Territory six hydraulic mining leases, covering an area of 17.96 square miles. Since the Hydraulic Mining Regulations were first established in December, 1898, 47 hydraulic mining leases have been issued, all of which have now been cancelled, with the exception of the above number. During the year eleven mines were operated by the hydraulic mining process, from which 1,702,264 cubic yards of material were removed.

## TIMBER IN THE YUKON TERRITORY

The total amount of dues collected on account of timber in the Yukon during the fiscal year was \$9,288.47. During the year 118 permits were issued, under the authority of which 13,152 cords of wood were cut. The dues collected on permits issued amounted to \$7,267.75.

There are in existence 76 timber berths, held under license to cut timber within the territory, covering an area of 164.75 square miles, which licenses were granted prior to May 10, 1906, on which date the regulations governing the granting of licenses to cut such timber in the territory were rescinded, and regulations for the issue of permits to cut timber substituted therefor.

According to returns received in the department, the number of lineal feet of lumber manufactured under license during the year and sold was 16,361, and the number of cords of wood cut was 2,750½. Seizure dues, amounting to \$157.75, were collected on 197 cords of wood cut in trespass. This does not include the very large amount of timber and cordwood cut free of dues for mining purposes.



WATER RIGHTS

There are now in force in the Yukon Territory 488 grants to divert water for mining purposes, aggregating a total of 120,445 miner's inches. During the last fiscal year six water rights were issued, comprising 700 miner's inches. Four grants were issued under regulations established by Order in Council authorizing the diversion of water in the Yukon Territory for power purposes. Up to date 13 grants have been issued, authorizing the diversion of 131,200 miner's inches of water. Four of these grants have been permitted to lapse, but the remaining nine, authorizing the diversion of 66,200 miner's inches of water, are in good standing. Two power plants have been installed, one of which is situated on the north fork of the Klondike river, and it appears that this plant is kept in operation during the winter, the power generated being used for heating and lighting purposes in the city of Dawson. These rights are now administered under the Dominion Water Powers Act.

HOMESTEADS IN THE YUKON TERRITORY

One hundred and four homestead entries have been granted in the Yukon Territory, of which sixty-three are now in force, comprising a total area of 9,610.56 acres. Patents have been issued for thirteen homesteads.

REVENUE OF DOMINION LANDS, INCLUDING THE YUKON TERRITORY

A.—STATEMENT of receipts on account of coal and minerals in the province and territories, also timber, hay, coal, hydraulic mining, dredging, royalty on gold, mining fees, rental of agricultural lands, water power and water fronts and sale of Dominion lands in the Yukon Territory, for the fiscal year which ended March 31, 1921:—

	\$	cts.		\$	cts.
Quartz acreage sales.. . . .	206	83	Free certificates, export of gold . . . . .	1	50
Dominion lands sales.. . . .	3,035	09	Stone quarry.. . . .	10,330	63
Coal lands sales.. . . .	125	06	Registration and office fees ..	305	15
Coal mining.. . . .	7,093	75	Homestead fees.. . . .	40	00
Coal royalty.. . . .	193,249	21	Hay, Yukon . . . . .	29	00
Coal rental.. . . .	256,420	07	Interim receipt account ..	672	31
Rental, Yukon.. . . .	6,175	50	Tar sands.. . . .	2,236	44
Timber dues, Yukon . . . . .	9,288	47	Sand, stone and gravel.. . . .	136	50
Mining fees.. . . .	66,196	08	Petroleum . . . . .	622,116	07
Hydraulic leases.. . . .	2,160	00	Potash . . . . .	893	80
Dredging leases, Western Provinces.. . . .	968	31	Quartz rental.. . . .	1,100	00
Dredging leases, Yukon.. . . .	394	55	Sales of improvements.. . . .	28	00
Gold export tax . . . . .	31,273	76	Gypsum . . . . .	50	00
			Water-power, Yukon.. . . .	600	00

B.—STATEMENT showing the total amount of revenue collected at each agency, including the Yukon Territory, for the fiscal year which ended March 31, 1921:—

	\$	cts.		\$	cts.
Battleford.. . . .	11,216	77	Saskatoon.. . . .	2,383	04
Calgary.. . . .	271,654	86	Swift Current.. . . .	5,307	53
Dauphin.. . . .	18,368	02	Unorganized.. . . .	46	00
Edmonton.. . . .	352,569	67	Winnipeg.. . . .	15,042	06
Grande Prairie.. . . .	141,759	10	Dawson, Gold Commissioner's office . . . . .	39,971	48
Kamloops.. . . .	631	00	Dawson, C.T. office.. . . .	6,716	66
Lethbridge.. . . .	156,529	76	Dawson, Royalty C. office.. . .	31,237	84
Moosejaw.. . . .	9,333	65	Dawson, Comp. office.. . . .	1	50
New Westminster.. . . .	34,592	28	Dawson, D. L. . . . .	6,524	84
The Pas, Manitoba.. . . .	8,380	61	Whitehorse, Min. Rec. office.. .	1,160	08
The Pas, Saskatchewan.. . . .	4,201	65	Whitehorse, C.T. office.. . . .	2,600	81
Peace River.. . . .	88,008	28	Whitehorse, R.C. office.. . . .	35	92
Prince Albert.. . . .	4,065	65	Whitehorse, Dom. L. office.. .	2,768	75
Revelstoke.. . . .	30	05			



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## DOMINION LANDS REVENUE—MINING LANDS AND YUKON BRANCH

## “A”

STATEMENT of receipts on account of coal and minerals in the Provinces and Territories, also timber, hay, coal, hydraulic mining, dredging, royalty on gold, mining fees, rental of agricultural lands, water power and water fronts and sale of Dominion Lands in the Yukon Territory, for the fiscal year which ended the 31st of March, 1921.

Quartz acreage sales.. . . . .	\$ 206 83
Dominion Lands sales.. . . . .	3,035 09
Coal sales.. . . . .	125 06
Coal mining.. . . . .	7,093 75
Coal royalty.. . . . .	193,249 21
Coal rental.. . . . .	256,420 07
Rental, Yukon.. . . . .	6,175 50
Timber dues, Yukon.. . . . .	9,288 47
Mining fees.. . . . .	66,196 08
Hydraulic leases.. . . . .	2,160 00
Dredging leases, Western Provinces.. . . . .	968 34
Dredging leases, Yukon.. . . . .	394 55
Gold export tax.. . . . .	31,273 76
Free certificates export of gold.. . . . .	1 50
Stone quarry.. . . . .	10,330 63
Registration fees, map sales, office fees.. . . . .	305 15
Homestead fees.. . . . .	40 00
Hay, Yukon.. . . . .	29 00
Water-power, Yukon.. . . . .	600 00
Tar sands.. . . . .	2,236 44
Sand, stone and gravel.. . . . .	136 50
Quartz rental.. . . . .	1,100 00
Gypsum.. . . . .	50 00
Interim receipt account.. . . . .	672 31
Petroleum.. . . . .	622,146 07
Potash.. . . . .	893 80
Improvements.. . . . .	28 00

## “B”

STATEMENT showing the total amount of revenue collected at each agency, including the Yukon Territory, for the fiscal year which ended the 31st March, 1921.

Battleford.. . . . .	\$ 11,216 77
Calgary.. . . . .	271,654 86
Dauphin.. . . . .	18,368 02
Edmonton.. . . . .	352,569 67
Grande Prairie.. . . . .	141,759 10
Kamloops.. . . . .	631 00
Lethbridge.. . . . .	156,529 76
Moosejaw.. . . . .	9,333 65
New Westminster.. . . . .	34,592 28
The Pas, Manitoba.. . . . .	8,380 61
The Pas, Saskatchewan.. . . . .	4,201 65
Peace River.. . . . .	88,008 28
Prince Albert.. . . . .	4,065 65
Revelstoke.. . . . .	30 05
Saskatoon.. . . . .	2,383 04
Swift Current.. . . . .	5,307 53
Winnipeg.. . . . .	15,042 06
Unorganized.. . . . .	46 00
Dawson, Gold Commissioner's office.. . . . .	39,971 48
Dawson, Royalty Collector's office.. . . . .	31,237 84
Dawson, Crown Timber office.. . . . .	6,716 66
Dawson, Comptroller's office.. . . . .	1 50
Dawson, Dominion Lands office.. . . . .	6,524 84
Dawson, Mining Recorder's office.. . . . .	18 25
Whitehorse, Crown Timber office.. . . . .	2,600 81
Whitehorse, Royalty Collector's office.. . . . .	35 92
Whitehorse, Dominion Lands office.. . . . .	2,768 75
Whitehorse, Mining Recorder's office.. . . . .	1,160 08



REPORT OF THE GOLD COMMISSIONER, DAWSON

The revenue of the office for the year was \$38,723.08, exclusive of rentals paid direct to the department at Ottawa. This is an increase of \$560.12 over last year. The statement lettered "A" shows how this amount was made up and the statement lettered "B" is a comparative statement of the receipts for the years ending March 31, 1920 and 1921, respectively.

PLACER GOLD MINING

Export tax was paid on 83,003,396 ounces of gold, which was practically the amount mined during the year. Owing to the fact that supplies must be imported during one open season sufficient to last until the following July, the merchants were obliged to buy their present stocks at the peak of the market so that while other parts of Canada are getting in some measure the advantage of reduced prices, food and supplies of all kinds are higher at the present time in Dawson than ever before in the history of the territory. This condition should improve during the coming summer, but until it does improve, a revival of gold mining cannot be expected, as under existing conditions only very rich gravels can be profitably worked.

YUKON GOLD COMPANY

This company's operations were on much the same scale as last year. Two dredges were operated during a dredging season of 128 days from May 26 to October 2. One of these dredges operated on claims Nos. 59 to 63, Below Discovery, Hunker Creek, and the other on claims Nos. 23 to 26-A, Gold Run creek. A total of 1,226,578 cubic yards of material was dredged.

This company had eleven hydraulic mines in operation at various times during the summer at the following points: Bunker Hill, Cheechaco Hill, Adams Hill, Americal Gulch, Oro Fino Hill, Fox Gulch, Monto Cristo, Trail Gulch, Lovett Hosford, Jackson Gulch, Gold Hill.

A total of 1,702,264 cubic yards was removed.

The company's hydro-electric power plant on the Twelvemile river furnishes the necessary power to carry on their various mining operations. As one unit of the plant referred to is now sufficient to furnish all the power needed, the remaining two units were dismantled during the past winter and hauled to the banks of the Yukon presumably for shipment to some other field.

The daily average of men employed was as follows:—

Hydraulic mines (April to October) .. .. .	71
Dredges and thawing (April to October) .. .. .	74
Ditch .. .. .	23
Otherwise employed .. .. .	56
Total .. .. .	224

CANADIAN KLONDYKE MINING COMPANY, LIMITED

This company operated two of their mammoth dredges in the Klondyke valley on Hydraulic Lease No. 18 and Dredging Lease No. 24. Dredge *Canadian No. 2* operated from May 18 to December 31, a period of 227 days, and 1,290,581 cubic yards of material was dredged. Dredge *Canadian No. 4* operated from May 14 to November 3, a period of 174 days, and 1,497,375 cubic yards of material was dredged.

The pumping plant situated near the mouth of Hunker creek pumps Klondyke river water to the hills and benches of lower Hunker and Last Chance creek and was in operation from May 20 until October 2. An average of 500 miner's inches of water was furnished.



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The power for these various mining operations was furnished by the Canadian Klondyke Power Company's, Limited, hydro-electric plant, situated at the north fork of the Klondyke river.

An average of 70 men were employed by this company.

## NORTH WEST CORPORATION, LIMITED

This company, which is under the same management as the Canadian Klondyke Mining Company, Limited, continued prospecting and work preparatory to dredging on their extensive holdings, which consists of 1,020 claims, 300,000 cubic yards of muck overlying the pay gravels was removed by water under pressure on Lower Dominion creek and similar operations on a smaller scale were carried on on Quartz creek.

Dredge *Canadian No. 1*, now known as *North West Dredge No. 1*, referred to in last year's report as being dismantled on Upper Hunker creek, was reassembled on No. 17 Below Lower Discovery on Dominion creek, and was operated from August 24 to November 8. 179,574 cubic yards of material was dredged.

A second dredge of 7½ cubic feet bucket capacity was purchased from the Yukon Gold Company and during the past winter hauled from Hunker creek to Lower Dominion, where it will be reassembled and operated this summer.

An average of 76 men were employed by this company in their various operations.

## TITUS DREDGING COMPANY

A dredge of 7 cubic feet bucket capacity owned and operated by the Titus Dredging Company was installed on No. 66 Hight creek, in the Upper Stewart district. Owing to delay in securing some necessary parts, occasioned chiefly by lack of telegraphic communication, the dredge was not ready to commence operations until September 1, and was operated until October 10. This is the first dredge installed in that district.

## OTHER PLACER OPERATIONS

Other than the large scale placer operations referred to, considerable mining by individuals and small companies was carried on as in former years.

## LODE MINING

In last year's report reference was made to a discovery of silver-lead ore on Keno Hill, near the head of Crystal and Lightning creeks in the Upper Stewart district. This discovery is undoubtedly the most important made in the territory since the gold discovery in 1896. Over 800 claims have been located and a very considerable amount of development work done. It has been demonstrated that the mineralized area is extensive and the ore of high value, but on only one property has sufficient work been done to speak with any assurance of the quantity of the ore.

Reference was made last year to the Yukon Gold Company having secured options on Discovery claim and adjoining properties on Keno Hill. These options have been taken up and a new company known as the Keno Hill, Limited, organized to develop them.

During the past summer this company had an examination made of the whole field by a very well-known geologist, and the engineers in charge are men of wide and successful experience.

The development last summer justified the company in making arrangements to mine and haul to Mayo, a distance of 40 miles, during the winter 3,000 tons of high-grade ore for shipment to the smelter on the opening of navigation. Owing to



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an accident to the power plant and other unavoidable delays, perhaps not more than 2,500 tons of ore will be landed at Mayo before the winter trail breaks, and unfortunately as yet there is no summer road upon which ore can be hauled. The company will, however, continue their development work during the summer.

A 75 k.w. generator was installed near Discovery on Duncan creek and the necessary power lines to Keno Hill, about four miles distant, installed. This plant commenced operations about the first of the year and furnishes light for the camp and mine and power to operate the company's hoists, drills, compressors, etc.

The men employed during the winter was as follows:—

Actual mining operations on Keno Hill.. . . .	35
Power plant.. . . .	4
Furnishing wood to power plant.. . . .	8
Ore transportation.. . . .	25
Total.. . . .	<hr/> 72 <hr/>

At least three other mining companies of world note have taken options on property in this district and will have their own engineers make examinations during the coming summer.

The most pressing needs of this promising district are roads and telegraphic communication.

The silver-lead properties on Spotted Fawn creek, a tributary of Twelvemile, is again receiving attention. A company known as the Spotted Fawn Company has been organized in New York and all arrangements perfected to commence operations on quite an extensive scale during the coming summer.

#### YUKON COUNCIL

The Yukon Council was in session from April 7 to 28 and legislation of considerable importance was enacted.

The existing Game Law was repealed and a new ordinance enacted.

An ordinance was also passed prohibiting the sale of intoxicating liquor for beverage purposes.

#### HOSPITALS AND PUBLIC HEALTH

St. Mary's hospital at Dawson and the General hospital at Whitehorse rendered their usual adequate services in their respective fields.

A modern X-ray machine was installed by the Government in St. Mary's hospital, the hospital having built a suitable addition for X-ray room.

#### EDUCATION

The public and high schools at Dawson and Whitehorse have been kept at their usual high state of efficiency. The number of pupils enrolled was slightly in excess of last year.

An assisted school was maintained at Mayo.

#### LAW AND ORDER

No serious crime was committed in the territory during the year. The Royal Canadian Mounted Police performed their usual efficient services. Frequent patrols were made to outlying districts.



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## REPORT OF THE CROWN TIMBER AND LAND AGENT, DAWSON

The revenue of the office for the year was \$13,144.65. Statement lettered "A" shows revenue collected in the Timber Branch from royalty on wood cut on timber berths. Dues paid in connection with timber and wood permits, seizure dues on wood cut in trespass, and dues in connection with hay permits. Statement lettered "B" shows revenue collected in the Lands Branch in connection with land rentals, land sales, office fees, rental of coal lands and homestead entries.

These statements show a total increase in revenue compared with last year of \$2,365.20, the increase in the Lands Branch being \$165.10, and in the Timber Branch, \$2,200.10.

Ninety-one permits to cut wood and timber were issued during the year. The number of feet b.m. cut under permits during the year on which dues were paid was 115,363 feet. Number of cords cut under authority of permits during the year 8,478. Other timber cut under permit, 1,000 fence poles. Number of feet b.m. cut and sold under license during the year, 16,361. Number of cords cut under license and sold, 2,750½.

## COAL

The Five Fingers Coal Company operated their mine at Tantalus, but the supply of coal furnished the Dawson market was inadequate owing to the fact that barges could not be secured to transport the coal from the mine.

## AGRICULTURE

The farmers have had a successful year. On account of the dry summer the potato crop although not up to the average in quantity was of good quality and brought high prices. The yield of other vegetables was satisfactory.

Great difficulty has always been experienced by the farmers in securing their seed grain, the oats sown being generally the ordinary feed oats, which necessarily does not give the best results. The territorial Government, realizing this fact and in an endeavour to assist the farmers, authorized the purchase of grain and fertilizer to be sold to the farmers at cost. One car of seed and one car of fertilizer was consequently imported last fall and has been distributed for use this spring. If this experiment works out satisfactorily, it will probably be continued on a larger scale another year.



REPORT OF INSPECTING ENGINEER OF MINES, O. S. FINNIE

During the year 1920, the production of coal in Alberta exceeded that in any previous year. In the province of Saskatchewan the production was somewhat less than the previous year owing to the fact that more Alberta coal found its way to the Saskatchewan and Manitoba market.

For the purpose of comparison, the schedule below indicates the output from these provinces for the two years, 1919 and 1920. It is divided into three classes, viz., coal subject to royalty on Dominion Lands, coal subject to royalty on School Lands, and coal not subject to royalty:—

Province	Calendar Year	Output subject to Royalty		Output not subject to Royalty	Total Output
		Dominion Lands	School Lands		
Alberta.....	1919	2,601,807	271,091	2,131,370	5,004,268
Saskatchewan.....	1919	43,037	22,062	319,018	384,117
Alberta.....	1920	3,631,672	523,318	2,752,773	6,904,935
Saskatchewan.....	1920	41,798	45,952	217,372	346,328

It will be observed that only a little more than half the total production is subject to royalty. This is accounted for by the fact that royalty is not levied on unmerchutable slack or on coal consumed under boilers at mines or coal taken from road allowances. Neither is it exacted on mines located on Hudson's Bay lands or lands given as subsidies to railways or lands disposed of prior to the introduction of royalty.

The following schedule indicates the total number of coal mines operated during 1919 and 1920, also those subject to royalty and those not subject to royalty:—

Province	Calendar Year	No. of Operating Coal Mines		Not subject to Royalty	Total
		Subject to Royalty			
		On Dominion Lands	On School Lands		
Alberta.....	1919	176	10	69	255
Saskatchewan.....	1919	55	6	3	64
Alberta.....	1920	177	16	76	269
Saskatchewan.....	1920	58	10	4	72

During the year all mines in the producing fields of Saskatchewan were inspected and surveyed. Estevan, the largest centre, has been very active and with the completion of the Government briquetting plant, the activity should materially increase.

The mines of southern Alberta, including Crowsnest Pass, in addition to those in the foothills south and west of Calgary, were inspected during the year. On the south branch of Sheep creek, in the Kootenay Coal Measures, considerable development work was done and it is altogether probable that sometime in the future a new field will be opened which will be one of the largest in the province.

The Drumheller field has also had an active season, having taken out more coal than during any other year. The Canadian Pacific Railway branch line from Acme to Drumheller is opening a new coal area along Kneehill creek, known as the "Carbon Field." At the present time development on a large scale is taking place and no doubt several new mines will be in operation during the coming year.

Thee Brazeau territory, west of Rocky Mountain House, is another field in which extensive development work was done. A considerable number of claims were staked



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in the vicinity of Saunders creek and a number of new mines opened. The boundaries of many of these claims overlapped, but during the year practically all the location posts were tied to the various section corners. In this way accurate descriptions by section and legal subdivision were possible. The description appearing in the leases by metes and bounds were substituted for the more accurate description.

The Yellowhead field, west of Edmonton, also developed a number of new mines, some of which are operated by steam shovel, and the output from this field also exceeded that of any previous year.

Two mining inspectors are located permanently in the west, their offices being in the Lancaster building, Calgary, where they make their headquarters.

In the Petroleum Engineer's Department a number of special and detailed investigations were undertaken in addition to the routine inspections and reports. Operations with the department's mudding and cementing equipment at the "wild" gas well of the Canada Cement Company at Medicine Hat were successfully completed. Many requests for advice and assistance from operators were complied with as far as it was within the power of the petroleum engineer and his assistant to do so.

Office records were enlarged and systematized. The careful classification and tabulating of well records is a very important part of the petroleum engineer's duty. Efficient supervision of boring operations cannot be carried on unless detailed information of the condition of the boreholes is intelligently compiled. At the present time we are endeavouring, with some success, to obtain data on boreholes drilled in former years. Before the office was established very little effort had been made to preserve this valuable information.

In September, 1920, Mr. C. W. Dingman was appointed temporarily to the position of petroleum and natural gas inspector.

Towards the end of the year the petroleum engineer was called to Ottawa to assist in the revision of the Petroleum and Natural Gas Regulations for the Northwest Territories.

A summary of the boring operations in Western Canada is herewith submitted.

## GENERAL

Boring operations for oil and gas were commenced on fifteen new locations in the period April, 1920-March, 1921, as follows:—

In Manitoba.. . . . .	1
In Saskatchewan.. . . . .	3
In Alberta.. . . . .	9
In British Columbia.. . . . .	2

One well was officially reported abandoned during the year. Three wells reported a flow of gas and one well brought in a production of oil.

Boring operations were conducted more or less actively on twenty-eight different locations.

## NORTHERN ALBERTA

*Peace River Field.*—The controlling of heavy flows of water at the base of the cretaceous still remains a problem with the operators. Seven or eight wells have been temporarily abandoned because of water trouble. Until the flow of water is successfully controlled, no idea of the productivity of this field can be formed.

Arrangements have been made to place the department's mudding and cementing equipment in the Peace River field during the 1921 season for the purpose of sealing off the water sands in the wells already drilled, and to develop a method of boring through the sand to test deeper horizons for oil.

Natural gas is being wasted in considerable volume from the wells which are temporarily abandoned.



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## CENTRAL ALBERTA

*Birch Lake Field.*—A borehole has been “spudded in” on the S.W. shore of Birch lake in section 14, township 50, range 12, west of the 4th meridian.

*Viking Gas Field.*—In townships 48 and 49, ranges 12 and 13, west of the 4th meridian.

No boring operations were conducted in the Viking gas field during the year. Nine (9) wells were drilled in and capped. All these wells produce gas with an open flow capacity ranging from 2,000,000 cubic feet to 8,000,000 cubic feet per twenty-four hours. The depth of the gas horizon is from 2,150 feet to 2,220 feet. A water horizon was penetrated below the gas, but has been effectively sealed off in all the wells. The total open flow capacity of the proven field is 40,000,000 cubic feet per twenty-four hours, indicating a working production of about 16,000,000 cubic feet per twenty-four hours. All these wells are maintained in excellent condition. No gas has been produced, but the field was drilled for the purpose of supplying Edmonton with gas by the Northern Alberta Natural Gas Development Company.

*Czar Field.*—A well is being drilled on crumpled beds in Legal subdivision 10, section 17, township 39, range 7, west of the 4th meridian, by the Northwest Company, Limited. Three water horizons were penetrated at 224 feet, 440 feet and 600 feet respectively, and have been effectively closed off.

*Monitor Field.*—Three drilling outfits, one of these being a rotary drill, are operating south of Monitor, Alberta. When inspected in November, 1920, none of these had drilled over 100 feet.

## FOOTHILLS SOUTH OF CALGARY

*The Turner Valley Field.*—An unfortunate occurrence during the year was the destruction of the gasoline absorption plant, operated by the Calgary Petroleum Products Co., Limited. Before the fire the plant produced from 500 to 700 gallons of gasoline per day from 2,000,000 cubic feet of gas produced from the company's two wells.

The Southern Alberta Oil Company, the Alberta Southern Oil Company, the Alberta Petroleum Consolidated Oil Company, the Illinois-Alberta Oil Company, and the Calgary Petroleum Products Company all produced oil during the year. Figures indicating the production from the field are not available.

Active boring operations were carried on at two locations in this field during the year.

*Willow Creek Field.*—Boring operations are being conducted on the S.E.  $\frac{1}{4}$  of section 29, township 14, range 2, west of the 5th meridian.

The Alberta Associated well in Legal subdivision 5, section 7, township 16, range 2, west of the 5th, which had been closed down for a number of years, was cleaned out and the borehole is now being deepened from 2,700 feet. Some “shows” of oil are being obtained.

*Pincher Creek Field.*—Two boreholes are being sunk south of the town of Pincher on the N.E.  $\frac{1}{4}$  of section 14, township 4, range 30, west of the 4th meridian, and on Legal subdivision 1 of section 20, township 3, range 29, west of the 4th meridian. At the latter location gas flows have been encountered. In the Waterton Lake district of the Pincher Creek field the attempts which have been made to clean out the old Lineham well (a producer in the early days) have been abandoned. An exploratory diamond drill hole is now being bored close by.



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## SOUTHERN ALBERTA PRAIRIE

*Bow Island Gas Field.*—A detailed investigation of the Bow Island field was carried out and a report submitted. The investigation brought out the following facts regarding the field:—

- (1) The gas "pool" is practically exhausted.
- (2) The field produced about 28,756,000,000 cubic feet of gas up to 1919.
- (3) The amount of gas remaining in the field is about one-quarter of the volume removed, but only a fraction of the remaining volume will be recoverable.
- (4) The original gauge pressure of the field registered 750 pounds, and in 1919, the pressure was 250 pounds.
- (5) "Edge" water is gradually encroaching on the gas field and the marginal wells are being "drowned out."

The company operating in this field employ very efficient methods and all the wells are maintained in as good a condition as is possible. The flooding of the sand with water is the result of natural conditions, and is not caused by improper drilling methods.

*Medicine Hat—Redcliffe Field.*—One borehole has been "spudded" in lately at Redcliffe, but no other boring operations were commenced. Medicine Hat city is carrying on commendable work in repairing old wells having defective casing which allowed an appreciable leakage of gas into the formations. The Medicine Hat field is showing a decided decline. Recent pressure tests indicate a drop of 50 pounds in the gauge pressure during the year.

## SOUTHERN SASKATCHEWAN FIELD

Drilling has been in progress on Legal subdivision 4, section 9, township 1, range 27, west of the 3rd, near the Manitoba boundary. There has been some structural disturbance here in the upper Belly river beds, and a well has been located on this folding.

A borehole is being drilled on the bank of the South Saskatchewan river in Legal subdivision 2, section 30, township 19, range 11, west of the 3rd meridian, in search of gas to supply Moosejaw and Regina. The boring here has been beset with many difficulties caused by running sands, and the first attempt to sink a well had to be abandoned.

## CENTRAL SASKATCHEWAN

A well is being drilled on section 7, township 39, range 22, west of the 3rd meridian, near the town of Unity, Saskatchewan. These drilling operations have not been inspected.

## BRITISH COLUMBIA

The boring operations which are being conducted near Vancouver were not inspected during the year.

## NORTHWEST TERRITORIES

The report of the flow of oil in the Northwest Company's well near Fort Norman, on the Mackenzie river, was received too late for an inspection to be made during 1920. It has been arranged to inspect the drilling operations in the Mackenzie district during the coming season.

The following information regarding the strike has been supplied by the company:—

The well is located on E. Procter's claim, Lease No. 11491, on the north bank of the Mackenzie river, about forty miles down stream from Fort Norman. The rocks



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penetrated are limestone and shales of Middle Devonian age. Almost every porous bed from a depth of 180 feet yielded oil at the rate of one to two barrels per day, and gas in increasing volume. At 783 feet a crumpled and faulted shale horizon was penetrated and yielded oil in large quantities. The oil flowed from the well by "heads," but it was immediately capped, and no attempt made to measure the capacity of the well. An analysis of the oil is submitted:—

Distillation:

70° — 150°	— 23.8%	gasoline
150° — 300°	— 38.2%	illuminating oil
300° — 350°	— 33.7%	light lubricating oil
350° — 375°	— 4.0%	medium lubricating oil
Loss	— 0.3%	

OPERATIONS WITH THE MUDDING AND CEMENTING EQUIPMENT

There are defective wells in Western Canada, which have defied all the efforts of the operators to repair. Among these are "wild" gas wells which waste large volumes of gas, and also wells that have encountered heavy flows of salt water, which, when not sealed off, threaten to ruin adjacent oil and gas sands.

In view of these conditions the department acquired a complete mudding and cementing equipment, to be under the charge of the petroleum engineer's staff. Upon application by an operator who is having difficulties in controlling his well, the use of the equipment may be obtained.

The success of the first operation undertaken fully justified the expenditure incurred in obtaining the equipment. The Canada Cement Company's well No. 5, at Medicine Hat, had been wasting gas at the rate of 2,000,000 feet daily for five years, and during that time various engineers and drillers had been attempting, unsuccessfully, to close the well. Four months after the department's staff began operations the gas flow was effectively sealed off.

Arrangements are now being made to move the equipment to Peace River, where several wells have been turned over to the petroleum engineer for cementing off water sands and controlling gas flows.



REPORT OF THE CONTROLLER, TIMBER AND GRAZING LANDS  
BRANCH, B. L. YORK

The total revenue derived from timber, grazing and hay lands during the fiscal year amounted to \$807,119.23. This is an increase of \$119,717.40 over the revenue for the past year.

TIMBER

Statements "A," "B," and "C," showing the total revenue, the revenue from the timber by agencies, and other sources of revenue by agencies, also statements from the Crown Timber Agents at Calgary, Edmonton, Prince Albert, Winnipeg, Kamloops, New Westminster and Revelstoke, showing the revenue collected within their respective agencies and other information, are appended hereto.

The report of the Superintendent of Dominion Timber Agencies, and the reports of the Inspectors of Ranches located at Calgary, Moosejaw and Prince Albert are also attached.

The revenue from timber, grazing and hay lands received at the Crown Timber Agencies, also the number of mills operated under license, and the number of mills operated under permit are as follows:—

Agency	Total Revenue	No. of Mills operating under license	No. of Mills operating under permit
	\$ cts.		
Calgary.....	55,024 88	11	13
Edmonton.....	156,020 51	30	89
Prince Albert.....	83,650 78	29	43
Winnipeg.....	116,621 24	29	51
Kamloops.....	54,817 98	8	—
New Westminster...	141,356 45	30	—
Revelstoke.....	33,593 11	13	—



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The return of operations received from the timber agencies show the quantity of timber and also other material manufactured and sold under license, to be as follows: -

	Manufactured	Sold
Sawn lumber, feet B.M.	266,990,738	227,111,196
Railway ties.....	728,819	880,369
Laths.....	25,546,350	18,395,600
Shingles.....		31,000
Mine props.....	564,207	513,857
Mine ties.....	4,029	4,029
Cordwood.....	1,593	1,593
Piling.....	253,704	283,440
Telephone poles.....	32,865	
Shingle bolts (cords).....	28,437	
Fence posts.....	124,089	
Round timber.....	2,394,642	
Logging cords.....	113	113

The total quantity of timber and other material manufactured and sold under permit and portable sawmill berths is as follows:—

	Manufactured	Sold
Sawn lumber, feet B.M.....	54,975,092	51,596,362
Railway ties.....	268,363	
Shingles.....	437,000	529,000
Laths.....	5,343,680	5,343,680
Fence posts.....	533,970	
Fence rails.....	14,591	13,565
Cordwood.....	9,572	8,702
Telephone poles.....	2,176	431
Mining timber, lineal feet.....	3,076,572	2,718,735
Mine ties.....	8,978	8,306

The quantity of lumber manufactured and sold within each agency will be found in the agent's report appended hereto.



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The area of timber lands held under license and permit in the provinces of Manitoba, Saskatchewan, Alberta and British Columbia is as follows:—

	Under License Square miles	Under Permit Square miles
Manitoba	1,028.69	392.97
Saskatchewan	1,528.74	144.78
Alberta	1,899.85	137.70
British Columbia	1,726.59	8.83
	6,183.87	684.28

During the year there were 171 berths granted, of which there were three license berths, 26 permit berths, 67 portable saw-mill berths and 75 cordwood berths. This is an increase of 42 berths granted during the previous year.

## GRAZING

On March 31, 1920, there were in force 6,201 grazing leases, covering an area of 6,487,634 acres as follows:—

	Acres
Manitoba.....	140,629
Saskatchewan ..	3,021,556
Alberta ..	2,908,215
British Columbia.....	417,234
	6,487,634

During the year 640 new leases were issued.



STATEMENT "A".—Statement of Revenue for Fiscal Year 1920-21

Timber.. . . . .	\$608,648 70
Grazing.. . . . .	139,026 03
Hay.. . . . .	22,907 57
Registration fee.. . . . .	343 14
Fireguarding dues.. . . . .	29,288 54
Improvements.. . . . .	725 00
Scaling fees.. . . . .	6,067 75
Scale books.. . . . .	112 50
Total.. . . . .	<u>\$807,119 23</u>

STATEMENT "B".—Statement of Revenue from Timber for Fiscal Year 1920-21

Bonus.. . . . .	\$ 41,529 90
Rent.. . . . .	82,312 15
Royalty.. . . . .	216,972 53
Permit fees, dues and rentals.. . . . .	249,969 09
Seizure dues.. . . . .	17,865 03
Scaling fees.. . . . .	6,067 75
Scale books.. . . . .	112 50
Total.. . . . .	<u>\$614,828 95</u>

STATEMENT "C".—Statement of Revenue from Grazing, Hay, Registration Fees, Improvements, for Fiscal Year 1920-21

Grazing.. . . . .	\$139,026 03
Hay.. . . . .	22,907 57
Registration fee.. . . . .	343 14
Fireguarding dues.. . . . .	29,288 54
Improvements.. . . . .	725 00
Total.. . . . .	<u>\$192,290 28</u>



CHIEF INSPECTOR OF DOMINION CROWN TIMBER OFFICES, E. E. STEPHENSON

STATEMENT "A" Summary of Work Performed and Revenue Collected in the Respective Crown Timber Offices, during the Year ended March 31, 1921

Agency	Timber and Grazing							Forestry			School Lands				Revenue \$ etc.
	Bonus	Ground Rent	Royalty on Sales	Timber Permits Issued	Timber Seizures	Hay Permits	Grazing Rentals	Sundries	Permit Fees and Rentals	Seizures	(Grazing) Rentals	Hay Permits	Seizures	(Grazing) Permits	
Battleford				492	24	961	413	85	258	18	171	34	0	484	26,309 72
Calgary		34	39	111	6	212	633	11	211	5	227	19	3	562	106,324 12
Dauphin				513	34	938	80		1,935	60	106	196	7	386	35,826 67
Edmonton	4	60	45	1,379	96	1,819	295	724	114	3	45	45	44	690	187,132 82
Grande Prairie				536	1	225	105	78						70	5,212 49
Kamloops	1	35	66	464	5	15	491	46	39	1	14	20		58	54,593 64
Lethbridge				10	1	84	1,296	5	350	2	247	9		51	61,695 04
Moose Jaw						697	709	9	130	1	178	128	2	701	46,186 17
New Westminster	8	193	314	53	7	420	195	352			4	6	1		138,086 93
Peace River				558	1	1,127	467	6	917	14	88	145	42	378	8,564 04
Prince Albert	1	59	63	796	79	1,127	467	6							110,629 47
Regina	3	86	33	181	1	1	111	18	301	10	145	156	6	774	33,593 11
Saskatoon				97	1	004	111	3	273	7	145	14	6	277	28,464 14
Swift Current				83	1	348	1,589	24	197	2	422	14	6	277	70,472 18
Winnipeg		51	58	1,815	66	1,336	44	44			171	136	117	877	126,860 19
Total	17	518	618	70,88	323	8,786	6,385	1,405	4,723	123	1,818	908	328	5,257	1,039,959 73
Previous year	20	571	684	6,815	386	9,841	6,262	1,522	5,810	174	1,582	1,091	189	4,826	923,688 12

N.B.—Revenue exclusive of payments made to Department on account of respective agencies.



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STATEMENT "B," Showing Manufacture and Sale of Timber Products Cut by Holders Permit During the Fiscal

Agency	Lumber			Lath		
	Manufac- tured	Sold	On hand	Manufac- tured	Sold	On hand
	Feet B.M.	Feet B.M.	Feet B.M.			
Calgary . . .	16,022,638	10,059,524	9,617,521			
Edmonton . . .	22,961,520	17,936,840	7,830,688	3,058,250	2,643,150	753,450
Kamloops.....	25,042,989	25,042,989	Not known			
New Westminster . . .	82,368,093	82,368,093	Not known			
Prince Albert.....	79,896,786	56,516,723	34,837,598	18,849,550	13,792,000	5,300,100
Revelstoke . . . .	17,834,960	17,834,960	Not known			
Winnipeg.....	22,863,752	17,352,067	9,487,084	3,638,550	1,960,450	1,678,100
Total.....	266,990,738	227,111,196	61,772,891	25,546,350	18,395,600	7,731,650

PERMIT

Calgary.....	2,530,433	1,667,197	1,126,287			
Edmonton.....	14,517,314	12,291,241	4,366,010	4,433,880	4,433,880	
Kamloops . . .	8,943,421	8,943,421	Not known			
New Westminster . . .	15,890,740	15,890,740	Not known			
Prince Albert.....	4,379,185	3,967,195	2,072,423	909,800	909,800	
Revelstoke.....	761,775	761,775	Not known			
Winnipeg.....	7,952,224	8,074,793	2,056,638			
Total.....	54,975,092	51,596,362	9,621,358	5,343,680	5,343,680	
Grand total.....	321,965,830	278,707,558	71,394,249	30,890,030	23,739,280	7,731,650
Previous year.....	271,805,941	264,922,206	57,454,912	17,198,597	30,371,985	8,851,180



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of Timber Berths on Dominion Lands and School Lands Under Yearly License and Year Ended March 31, 1921.

Railway Ties	Shingle Bolts	Round Timber	Saw-logs			Fence Posts
			Pieces cut	Manufactured	On hand	
502,514	Cords	1,634,730	472,238	417,532	412,425	
409,200	900	475,562	493,801	370,345	2,417,739	
74,659	138	51,671	223,590	223,590	Not known	
42,737	24,689	208,460	136,989	126,229	11,658	
13,255			779,187	1,424,649	907,980	
	2,710	24,219	158,699	158,699	Not known	98,640
17,790			357,301	438,831	450,002	
1,060,155	28,437	2,394,642	2,621,805	3,159,875	4,199,804	98,640

BERTHS

		2,981,056	173,774	150,734	64,725	
17,433	1,322	98,516	340,321	262,336	191,409	14,062
162,562	56	111,335	Not known	Not known	Not known	264,865
4,709	6,581		Not known	Not known	Not known	
7,589			81,015	80,086	56,766	
55,472	1,250	4,600	Not known	Not known	Not known	205,233
20,598			137,500	148,668	99,997	
268,363	9,209	3,195,507	732,610	641,824	412,897	483,160
1,328,518	37,646	5,590,149	3,354,415	3,801,699	4,612,701	582,800
1,149,536	62,846	3,271,010	3,596,975	2,852,414	2,815,083	1,235,288

E. F. STEPHENSON,  
*Superintendent.*



STATEMENT "C" Timber Material Covered by Permits Issued at the Respective Agencies, Principally to Settlers during the Year ending March 31, 1921

Agency	Lumber and Logs	Fence Rails	Poles	Fence Posts	Cordwood	Pulpwood	Railway Ties	Telegraph and Telephone Poles	Round Timber	Shingle Bolts
	Pt. B.M.				Cords	Cords			Lin. ft.	Cord
Battleford.....	2,460,728	59,125	13,090	45,663	3,043					10,000
Dauphin.....	11,674,049	14,580	1,560	122,716	19,089					
Calgary.....	1,089,527	18,402	9,392	26,137	2,976		2,000	40,100	856,495	
Edmonton.....	16,439,472	2,518,528	158,500	791,728	7,957		681,590	71,014	678,231	
Grande Prairie.....	3,648,837	587,704	108,843	143,123	158					
Kamloops.....	10,266,846	3,330	2,150	264,984	6,045		256,000	63,410	4,457	56
Lethbridge.....	175,638	900	100	21,363	2,064			12	1,020,100	
Moosejaw.....	17,010	50	100	16,575	747					
New Westminster.....	15,890,740			2,560	673		1,709			6,580
Peace River.....	3,023,529	60,525	72,271	83,507	1,573			264		
Prince Albert.....	23,262,668	250,748	91,573	262,177	34,241		14,690	1,000	89,807	
Revelstoke.....	775,575	400	24	205,233	1,342		55,472	4,657		1,250
Saskatoon.....	865,270	5,250	2,350	7,025	2,707					
Swift Current.....	81,090	21,015	1,000	26,925	2,524					
Winnipeg.....	15,943,331	23,491	11,675	229,660	5,602		38,481	14,500	9,237	10,000
Totals.....	105,714,310	3,594,248	472,628	2,252,376	90,561		3,743			
Previous year.....	100,369,615	2,068,118	1,306,481	2,248,236	172,348		1,052,942	194,977	2,658,327	11,886
							582,721	101,918	1,008,000	11,114



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STATEMENT "D," Showing the Number of Hay Permits Issued at the Respective Crown Timber Offices and the Amount of Hay Covered thereby for the Year Ended March 31, 1921.

Agency	Dominion Lands		School Lands		Forestry Lands		Revenue from Hay
	No. of Permits issued	Hay	No. of Permits issued	Hay	No. of Permits issued	Hay	
		Tons		Tons		Tons	
Battleford.....	961	13,566	484	5,762	34	1,885	3,047 20
Calgary .....	267	5,967	529	9,986	19	458	2,934 30
Dauphin ...	938	15,359	386	5,814	278	4,869	5,442 54
Edmonton.....	1,819	16,934	690	6,629	45	1,596	4,822 52
Grande Prairie. . . . .	225	837	70	1,192	.....	.....	581 90
Kamloops.....	14	89	.....	.....	18	201	125 75
Lethbridge.....	84	1,109	58	778	7	45	185 80
Moosejaw .....	682	11,032	585	13,085	124	4,548	3,983 75
New Westminster . . . .	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	.....
Peace River .	420	8,354	98	1,618	6	290	1,386 70
Prince Albert.....	1,833	16,278	368	3,865	127	2,983	5,186 16
Revelstoke.....	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	.....
Saskatoon.....	668	12,955	766	13,611	156	6,318	5,305 21
Swift Current.....	348	11,153	277	4,186	13	218	1,023 95
Winnipeg .....	1,278	11,977	846	11,549	138	2,696	9,450 62
Total .....	9,537	125,610	5,157	78,075	965	26,107	43,476 40
Previous year.....	9,826	176,187	5,070	80,660	1,209	34,153	49,395 94

The falling-off in hay revenue is due to the abundant hay crop throughout the west in the year 1920, which enabled many to meet their needs from their own lands.

## REPORT OF THE FINANCIAL CONTROLLER, G. D. POPE

STATEMENT of Revenue Collected from Various Sources during the Fiscal Year ended March 31, 1921, as follows

A. Dominion Lands, including Yukon.. . . .	\$ 4,086,076 49
B. School Lands.. . . .	4,480,270 67
C. Ordnance Lands.. . . .	8,887 88
D. Registration fees, Yukon.. . . .	448 31
E. Fines and forfeitures.. . . .	1,139 75
F. Casual revenue.. . . .	811,970 45
G. Seed grain and relief repayments.. . . .	773,200 67
H. Sales of railway lands, special account.. . . .	27,602 30
	<u>\$10,189,596 52</u>

A statement of revenue on account of Dominion Lands marked "I", shows the receipts classified under sub-heads.

Statement marked "J" shows a comparison between the revenue of the present fiscal year and that of the previous twelve months.



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DOMINION LANDS REVENUE (Cash and Scrip) for the Fiscal Year ended March 31, 1921

Agencies	Cash	Scrip	Total
	\$ cts.	\$ cts.	\$ cts.
YUKON TERRITORY			
Sales of land..	3,241 92		3,241 92
Rentals of land.....	6,170 50		6,170 50
Map sales, office fees, etc	30 00		30 00
Timber dues ..	9,288 47		9,288 47
Hay permits.....	29 00		29 00
Mining fees.....	37,185 28		37,185 28
Export tax on gold.....	31,126 21		31,126 21
Free certificates for export of gold	1 50		1 50
Hydraulic leases.....	2,160 00		2,160 00
Dredging leases.....	424 88		424 88
Homestead fees.....	40 00		40 00
Rent of water power .....	600 00		600 00
Coal royalty and fees ..	45 00		45 00
Interim receipt account ..	578 15		578 15
	90,920 91		90,920 91
DOMINION LANDS AGENCIES			
Battleford.....	66,835 30		66,835 30
Calgary.....	417,954 51		417,954 51
Dauphin .....	8,545 09		8,545 09
Edmonton.....	40,724 41		40,724 41
Grande Prairie.....	10,550 32		10,550 32
Kamloops .....	6,654 84		6,654 84
Lethbridge.....	121,219 29		121,219 29
Moosejaw.....	444,157 29		444,157 29
New Westminster .....	4,355 58		4,355 58
Peace River .....	12,541 47		12,541 47
Prince Albert.....	17,724 60		17,724 60
Revelstoke .....	2,237 64		2,237 64
Saskatoon .....	166,755 07		166,755 07
Swift Current .....	483,819 18		483,819 18
Winnipeg.....	33,063 00		33,063 00
	1,837,137 59		1,837,137 59
CROWN TIMBER AGENCIES			
Battleford.....	2,905 43		2,905 43
Calgary.....	50,046 30		50,046 30
Dauphin.....	26,651 85		26,651 85
Edmonton.....	168,027 07		168,027 07
Grande Prairie.....	2,006 13		2,006 13
Kamloops.....	48,553 66		48,553 66
Lethbridge.....	4,071 77		4,071 77
Moosejaw.....	420 60		420 60
New Westminster.....	141,336 65		141,336 65
Peace River.....	2,996 90		2,996 90
Prince Albert.....	102,629 94		102,629 94
Revelstoke.....	31,237 72		31,237 72
Saskatoon.....	1,700 10		1,700 10
Swift Current.....	482 30		482 30
Winnipeg .....	112,958 88		112,958 88
	696,025 30		696,025 30



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## DOMINION LANDS REVENUE (Cash and Scrip) for the Fiscal Year ended March 31, 1921

Agencies	Cash	Scrip	Total
	\$ cts	\$ cts	\$ cts.
MISCELLANEOUS			
Rocky Mountain Park.....	60,961 23		60,961 23
Jasper Park.....	5,473 12		5,473 12
Yoho Park.....	1,206 09		1,206 09
Waterton Lakes Park.....	2,896 13		2,896 13
Elk Island Park.....	31 50		31 50
Buffalo Park.....	124 15		124 15
Glacier Park.....	230 82		230 82
Fort Anne Park .....	38 00		38 00
Antelope Park.....	409 60		409 60
Moose Mt. Buffalo Park.....	35 60		35 60
Point Pelee Park.....	1,341 15		1,341 15
Miscellaneous Parks.....	4,102 70		4,102 70
Survey fees.....	31 65		31 65
Map sales, office fees, and registration fees.....	14,182 35		14,182 35
Fees, Board of Examiners, D.L.S.....	200 00		200 00
Suspense Account .....	3,400 79		3,400 79
Grazing lands.....	183,756 97		183,756 97
Grazing lands (improvements).....	760 00		760 00
Hay permits .....	30,188 62		30,188 62
Irrigation fees.....	399 00		399 00
Irrigation sales.....	7,573 68		7,573 68
Forestry Branch, sale of trees, etc.....	7,269 12		7,269 12
Fishing permits.....	1,660 00		1,660 00
Coal lands.....	457,020 08		457,020 08
Mining fees .....	28,639 45		28,639 45
Dredging leases.....	1,018 34		1,018 34
Stone quarries.....	9,842 92		9,842 92
Rent of waterpower.....	2,644 93		2,644 93
Sand stone and gravel.....	2,537 74		2,537 74
Petroleum.....	620,872 62		620,872 62
Potash leases.....	893 80		893 80
General sales.....	81 96		81 96
Improvements.....	84 71		84 71
Rentals.....	5,003 67		5,003 67
Miscellaneous.....	6,977 60		6,977 60
Northwest Territories.....	102 60		102 60
	1,461,992 69		1,461,992 69
Total revenue.....	4,086,076 49		4,086,076 49
Less refunds.....	130,750 93		130,750 93
	3,955,325 56		3,955,325 56

## STATEMENT of Receipts on Account of School Lands Revenue for the Fiscal Year ended March 31, 1921

Manitoba School Lands.. .. .	\$ 409,772 88
Saskatchewan School Lands.. .. .	2,851,257 91
Alberta School Lands.. .. .	1,219,239 88
Total revenue.. .. .	\$4,480,270 67

## STATEMENT of Ordnance Lands Revenue for the Fiscal Year ended March 31, 1921

Fiscal Year	Gross Revenue	Refunds	Net Revenue
	\$ cts.	\$ cts.	\$ cts.
1920-21.....	8,887 88	10 00	8,877 88



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STATEMENT of Registration Fees in the Yukon Territory for the Fiscal Year ended  
March 31, 1921

Fiscal Year	Gross Revenue	Land Assurance Fund	Net Revenue
	\$ cts.	\$ cts.	\$ cts.
1920-1921.....	448 31	7 31	441 00

## STATEMENT of Fines and Forfeitures for the Fiscal Year ended March 31, 1921

Fiscal Year	Northwest Territories	Migratory Birds Act	General	Total Revenue	Refunds	Net Revenue
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1920-1921.....	155 00	187 75	797 00	1,139 75		1,139 75

## STATEMENT of Casual Revenue for the Fiscal Year ended March 31, 1921

Fiscal Year	Particulars	Gross Revenue	Refunds	Net Revenue
		\$ cts.	\$ cts.	\$ cts.
1920-21	Casual revenue, Miscellaneous .....	808,553 45	1,148 15	807,405 30
1920-21	Casual revenue, N.W.T. ....	3,417 00	7 50	3,409 50
		811,970 45	1,255 65	810,814 80

STATEMENT Showing Net Repayments of Seed Grain and Relief Mortgages for Fiscal  
Year ended March 31, 1921

Year	Gross Collections	Refunds	Net Receipts
	\$ cts.	\$ cts.	\$ cts.
1876.....	1,045 27	107 49	937 78
1886-7-8.....	825 51	1 37	824 14
1890.....	455 58	11 36	444 22
1894.....	1,090 31	3 07	1,087 24
1895.....	1,255 28	16 47	1,238 81
1896.....	550 16	84 15	466 01
1900.....	51 12	16 03	35 09
1901.....	61 40		61 40
1905.....	156 67	10 00	146 67
1908.....	5,829 72	116 58	5,713 14
1909.....	1,237 34		1,237 34
1911.....	4,856 49	35 01	4,821 48
1912.....	8,501 54	131 55	8,369 99
1913.....	980 40	6 33	974 07
1914.....	2,177 41	59 92	2,117 49
1915.....	393,183 06	12,282 49	380,900 57
1915, relief .....	224,207 57	2,065 97	222,141 60
1917.....	8,141 68	35 32	8,106 36
1918.....	30,882 15	1,032 48	29,849 67
1919.....	51,564 34	2,249 61	49,314 73
1920.....	17,193 11	4,561 53	12,631 58
1920, relief.....	16,445 10	3,715 45	12,729 65
Relief advances prior to 1915.....	2,509 46	47 32	2,462 14
	773,200 67	26,589 50	746,611 17



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DOMINION LANDS REVENUE for the Fiscal Year ended March 31, 1921. Credited to the  
Special Accounts of the Following Railway Companies

Railway Company	Date of Order in Council	Amount	Total
		\$ cts.	\$ cts.
Lake Manitoba Railway and Canal Co.....	December 5, 1908	27,602 30	27,602 30
Canadian Northern Railway System..			

STATEMENT of Gross Cash Receipts on Account of Dominion Lands Revenue for the  
Fiscal Year ended March 31, 1921

Source of Revenue	Amount
	\$ cts.
Homestead fees.....	53,880 00
Sale fees.....	50 00
Improvements.....	70,492 66
General sales of land.....	1,721,171 61
Timber dues.....	705,313 77
Rental from grazing lands.....	183,756 97
Export tax on gold, hay, coal, petroleum, mining fees, etc....	1,234,558 49
Canadian National Parks.....	76,850 09
Survey fees.....	31 65
Map sales, rentals, office fees, and Miscellaneous.....	39,971 25
	4,086,076 49

STATEMENT of Gross Receipts (Cash and Scrip) on Account of Dominion Lands  
Revenue for the Fiscal Year ended March 31, 1921, Compared with the Previous  
Year.

Particulars	1920-21	1919-20	Increase	Decrease	Net Decrease
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Dominion Lands Agencies.....	1,837,137 59	2,894,602 74		1,057,465 15	
Crown Timber Agencies.....	696,025 30	584,127 15	111,898 15		
Hay, grazing, coal, petroleum, etc.....	1,385,142 60	1,085,980 26	299,162 34		
Yukon Territory.....	90,920 91	97,468 63		6,547 72	
Canadian National Parks.....	76,850 09	76,742 07	108 02		
	4,086,076 49	4,738,920 85	411,168 51	1,064,012 87	652,844 36



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REPORT OF THE ORDNANCE AND ADMIRALTY LANDS BRANCH, FOR  
THE FISCAL YEAR ENDED MARCH 31, 1921  
JOS. P. DUNNE, SUPERINTENDENT

Within the period covered by this report one sale of land by public auction was held in the city of Sorel, concerning which a detailed account is given under that locality.

With respect to those properties previously sold or occupied under leases granted under the provisions of the Ordnance and Admiralty Lands Act, or originally issued by the Imperial authorities with the privilege of converting those leasehold properties into freehold on payment of the purchase price in full, five whole lots or parcels and three part lots situated in the respective localities hereunder mentioned have been paid for in full and letters patent issued therefor.

## KINGSTON

One lot forming part of "Artillery Park" and which was sold and paid for in full some years ago, letters patent being withheld, however, pending the filing of a suitable plan and description. Satisfactory arrangements having been made with the present owner, letters patent were issued for the lot in question.

## MONTREAL

When the property known as the "Logan Farm" was subdivided and sold certain streets and lanes were laid down on the plan, which streets and lanes became vested in the corporation, so long as the same continued to be used for the purposes for which they were set apart. The adjoining land was acquired by the Notre Dame Hospital and as the corporation of the city of Montreal conveyed to the hospital authorities the interest held in the lanes in question, the Crown confirmed the transfer by relinquishing its claim and granted letters patent in the form of a Quit Claim deed.

## NEPEAN

The lots referred to under this heading form part of the subdivision of township lots 39 and 40, first concession, Ottawa Front, now within the limits of the city of Ottawa. During the past fiscal year two whole lots and one part lot were redeemed and letters patent issued.

The sum for which these lots were sold is \$644.58, of which \$410.24 was received within the fiscal year.

## OTTAWA

Certain lots in this locality are occupied by tenants under leases granted by the Imperial authorities and amongst other things provided these tenants may obtain title in fee simple for the land occupied on payment of the purchase price in full. During the fiscal year one whole lot and two part lots were redeemed and letters patent issued therefor. The total amount of consideration money received was \$474.25.

## SOREL

Twenty lots or parcels of land, forming part of the reserve lying south of Victoria street, in the city, were offered for sale at public competition and sold to the corporation of the city of Sorel. The amount realized on the sale was \$16,801.64, of which \$4,819.35 was paid in cash.

The following statements are hereto annexed, namely, "A," "B," "C," and "D," which are self-explanatory.



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## "A"

STATEMENT giving the number of lots and part lots sold or redeemed, the amounts for which such lots were originally disposed of and the sum received as instalment or balance of purchase money during the fiscal year ended March 31, 1921.

Locality	No. of lots sold or redeemed	Amount of consideration or purchase money	Amount received on account during fiscal year	Remarks
Kingston.....	"B"	\$ cts.	\$ cts.	Paid for previously. Issue of patent held for further information.
Montreal.....	Lanes			Quit claim deed.
Nepean.....	1	91 98	41 98	
	1	360 85	216 51	
	1	191 75	151 75	
Ottawa.....	1	200 00	200 00	In full.
	1	90 00	90 00	"
	1	184 25	184 25	"
		1,118 83	884 49	

## "B"

STATEMENT naming the various localities where Ordnance Lands are situated on account of which monies have been received during the fiscal year ended March 31, 1921.

Locality	Total
Amherstburg.....	\$ cts. 2 00
Beaver Harbour..	10 00
Burlington Beach.....	120 00
Carillon.....	0 20
Elmsley.....	7 00
Edmundston	1 00
Fort Cumberland.	64 00
Fort Erie.....	2 00
Grand Falls.....	71 85
Grenville.....	2 20
Kingston.....	204 50
Nepean.....	1,099 04
Oxford.....	5 20
Ottawa.....	939 31
Owen Sound.....	51 00
Port Maitland.....	146 73
Prescott.....	1 00
Point Edward.....	200 00
Queenston.....	2 00
Quebec.....	830 00
Sorel.....	4,936 75
Wolford.....	154 00
	8,852 38
Fees.....	35 50
Total.....	8,887 88



“C”

STATEMENT showing the receipts each month of the year classified as fees, rents, or interest equivalent to rent and principal for the fiscal year ended March 31, 1921.

Month	Fees	Rent or interest	Principal	Total
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
1920				
April.....	6 00	277 90	102 17	386 07
May.....	2 00	61 80	140 15	203 95
June.....	4 50	928 60	4,819 35	5,752 45
July.....	5 00	231 30		236 30
August.....		19 20	105 80	125 00
September.....		4 44		4 44
October.....	5 00	62 65	234 34	301 99
November.....		132 60	326 23	458 83
December.....		191 90		191 90
1921				
January.....	10 00	120 60		130 60
February.....	3 00	326 50	635 00	964 50
March.....		131 85		131 85
	35 50	2,489 34	6,363 04	8,887 88

“D”

STATEMENT showing amounts due and unpaid on account of purchase money and rent or interest for the fiscal year ended March 31, 1920

Locality	Rent or interest	Principal	Total
	\$ cts.	\$ cts.	\$ cts.
Burlington Beach....	300 00		300 00
Chambly.....	117 00	50 00	167 00
Dalhousie.....	28 06	23 00	51 06
Elmsley.....	3 20		3 20
Edmundston.....	1 00		1 00
Grand Falls.....	197 55	229 21	426 76
Marlborough.....	13 00		13 00
Niagara.....	288 99	507 00	795 99
Nepean.....	240 00	875 00	1,115 00
Owen Sound.....	10 25		10 25
Oxford.....	1 50		1 50
Oromocto.....	1 25		1 25
Ottawa.....	1,118 72		1,118 72
Port Maitland.....	42 14		42 14
Presqu'Isle.....	5 50		5 50
Sorel.....	137 68		137 68
Shelburne.....	3 00		3 00
St. Joseph's Island.....	236 42		236 42
Tay.....	48 00		48 00
Wolford.....	86 60		86 60
	2,879 86	1,684 21	4,564 07



## PART II

# DOMINION PARKS

## REPORT OF THE COMMISSIONER, J. B. HARKIN

In reviewing the work carried on in connection with the Dominion Parks during the past fiscal year it is gratifying to note that in spite of unfavourable economic conditions, which necessitated expenditure on development and publicity being reduced to the lowest possible amounts, the national parks have had one of the most successful years in their history. The steady increase in travel, not only to such famous resorts as Banff, Lake Louise and Glacier, but to the smaller and less widely known parks as well, is an indication that the parks are fulfilling the purpose for which they were created and that they are rendering a service to the Canadian people truly national in scope. Waterton Lakes park, in southern Alberta, though small in area compared with some of the other parks, had nearly 14,000 visitors, an increase of several thousand over any previous year. This park can be reached only by motor. An analysis of the registrations shows that while the bulk of its traffic was drawn from Alberta a large number of visitors came from the other provinces and from the United States and other foreign countries as well. A similar increase was shown at the Wainwright and Elk Island buffalo parks and also at Yoho and Glacier and Point Pelee, while the parks among the Thousand Islands were crowded with visitors, picnickers and campers practically every day during the season.

The largest percentage of foreign travel went, as usual, to the great resorts in the Rockies. At these places the volume of travel was so great that it was difficult at times to supply adequate accommodation and during the height of the season the facilities of both railways and hotels were severely taxed. Plans were made some time ago for increased hotel accommodation at several of these points but owing to the unsettled labour conditions they are being held in abeyance. The following statement based upon hotel registrations and a careful estimate made by the officers in charge of the parks shows the volume of travel during the past year:—

Rocky Mountains park.. . . . .	78,882
Yoko park.. . . . .	2,500
Glacier park.. . . . .	3,779
Mount Revelstoke park (estimated).. . . . .	4,000
Waterton Lakes park.. . . . .	13,750
Jasper park.. . . . .	10,000
Buffalo park.. . . . .	7,500
Elk Island park.. . . . .	4,300
Point Pelee park (estimated).. . . . .	6,000
St. Lawrence Islands (estimated).. . . . .	20,000
	<hr/>
	150,711

An analysis of this traffic reveals that from 50 to 60 per cent of the travel to the resorts of the Rockies is from foreign countries. In the smaller and less widely known parks the patronage is more largely local. The total number of foreign visitors to the parks in the Rockies last year was approximately 50,000. Allowing an average expenditure of \$300 for each foreign visitor, this travel represents an indirect revenue



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to the country of \$15,000,000. Capitalized on a basis of a five per cent dividend it means that the mountain parks alone are worth \$300,000,000 to the people of Canada. This does not take into account the money the parks keep at home by providing Canadians with unequalled recreation and pleasure grounds or the direct revenue derived from park licenses, sale of privileges, timber, etc., which last year amounted to over \$81,000. The total appropriations for all the parks last year were approximately \$720,000; that is, the cost of maintenance and development for all the parks was less than one-quarter of one per cent of the capitalized value of the foreign tourist traffic mentioned above. It must be remembered, too, that a considerable part of this appropriation was spent on new road construction forming an investment on capital account which will bring in its own revenue in the near future. The total expenditures for national parks since 1896 have been a little over \$5,000,000; that is, the whole cost of maintenance and development of the national parks during the past 25 years has been a little more than one-third of the foreign revenue which the mountain parks brought into the country last year.

#### TOURIST TRAVEL IN CANADA

A noticeable feature with regard to tourist traffic generally has been the tide of travel turning toward Canada in the past two years. This is probably the result of the greater advertising being done by Canadians and partly the result of conditions arising out of the war. Whatever the cause, it is evident that Canada is being discovered as a playground. Practically every province reported the heaviest travel in its history last year. British Columbia, according to figures compiled by Reginald Davidson, Publicity Commissioner for Vancouver, derived a revenue of \$20,000,000 from this source, one-third of which came to Vancouver. Tourist travel to Montreal in 1919 was estimated at \$4,000,000, and last year's business, as about one-third greater. The St. Lawrence resorts and the Muskoka and Georgian Bay districts and the Maritime Provinces all had a record year. The value of motor travel alone from other countries into Canada was probably \$20,000,000. According to figures furnished by the Department of Customs over 93,300 cars entered Canada during the calendar year 1920. Of these 1,800 registered for more than one month and 91,500 for a shorter period. Allowing an average expenditure of \$15 per day, including gasoline and garage charges, for the first class of car and an average length of stay of thirty days, this traffic amounted to \$810,000 while the second class of car, on a basis of an estimated expenditure of \$25 per day for seven days, was worth \$16,000,000, or \$16,810,000 in all. That is, the motor highways of Canada brought in last year a foreign revenue equal to the above sum. Estimated on the basis of a five per cent dividend, Canadian roads were, therefore, worth \$340,000,000 to the country without taking into account the service they rendered Canadians themselves. While no definite figures have been compiled I believe that the total value of tourist traffic into Canada last year would be not less than \$75,000,000.

And Canada's resources in this respect have only begun to be developed. In her climate, her virgin forests, her big game and fishing, her picturesque Indian and French Canadian traditions, her great hinterland of wilderness, she possesses a wealth of natural attractions capable of practically unlimited development. But it must be remembered that tourist traffic is largely a matter of stimulus and at the present time Canada is competing with many other countries which are putting forth highly organized efforts to attract and take care of this traffic. The European nations are making strenuous efforts to regain their pre-war revenues. The French Bureau of Touring is carrying on a very active propaganda. Switzerland and Italy are making special efforts to re-attract their former patronage. Belgium since the war has spent 16,000,000 francs in rebuilding her roads so as to fit them for motor travel. The Automobile Association of Great Britain is making arrangements for the reception



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of foreign motorists on an organized scale as yet unknown in this country. In the United States the "See America First" and the National Parks movements, backed by the almost universal support of the press and practically every public spirited organization in the country, have been engaging in an active propaganda encouraging Americans to keep their travel money at home. The value of their national parks as a means of attracting tourist traffic is widely recognized. The Director of the United States National Parks Service say in his last report:—

"Beyond the Mississippi the fact that the parks are the great lodestones of the West has been fully acknowledged. They attract visitors as do nothing else. People of all classes and means arrive. Every visitor is a potential settler, a possible investor. Were each visitor to spend an average of \$100 on his tour, and this figure I feel confident is considerably below the average, it means \$100,000,000 left on these park trips alone—not within the parks solely but along the whole route of travel, left in this country for the development of our industries and resources rather than to accrue to the benefit of foreign countries."

Travel to the United States parks has increased from 356,097 in 1916 to 1,058,455 in 1920. On the same basis of value as given by the Director of the National Parks Service above, this means that travel to the United States parks was worth \$65,000,000 more in 1920 than in 1916; that is, the parks have increased their national value to the country to that extent. This is largely due to the widespread support of the parks movement in the United States. It constitutes the best argument that can be made in favour of an active policy of publicity and development in connection with the Canadian national parks and scenic resources generally. It shows not only what could be accomplished in Canada, but the competition Canada must meet, if she is to develop her own industry to achieve similar satisfactory results.

## MOTOR TRAVEL

An analysis of the travel to the United States parks indicates that tourists coming by private automobile represent 65 per cent of the park visitors. This is largely due to the fact that the principal parks are all accessible by good motor roads and the majority linked up by their magnificent park-to-park system. As soon as the Canadian Transmontane highway is completed I look forward to the same increase of travel to the Canadian parks. Everything seems to point to the motor as the great factor in transportation for the next twenty years. A comparison of railroad mileage with highway mileage in the United States shows that the latter is ten times greater than the former. There are at the present time 2,478,552 miles of highways and 253,626 miles of railways in the United States. Registrations in January, 1920, showed that there were over 6,000,000 cars in the country or approximately one to every seventeen of the population. It is to the motor that we must look for the greatest development in so far as tourist travel is concerned and this consideration has a definite bearing on the development of park policy. It means that the construction of good roads within and linking up with the parks and the great highways of the country becomes of paramount importance and it also means the provision of campsites and other conveniences suited to this form of travel.

## MOTOR HIGHWAYS

With this in view construction work in the Canadian parks for several years past has been centred on the development of our road system, the most important feature of which at the present time is the construction of the road from the Vermilion summit to the Columbia valley. As has been pointed out before this road is the last



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link necessary to open up the Rockies to through travel from both east and west. It will link up the Canadian parks with the United States park-to-park highway system and allow the motorist to go from Banff to California by a direct route via the most remarkable scenery on the continent. Work on parts of this section is very heavy owing to the extensive rock cutting involved. Much of it is solid rock excavation with cuts ranging from 20 to 60 feet. The long distance from a base of supplies also adds to the difficulties of the work and these have been increased by the labour stringency, but, considering the difficulties, good progress has been made. Contract for three miles of road on the western end through the narrow Sinclair valley, which had been constructed by the British Columbia Government some years ago but which had been washed out, was let in August, 1919, and the work concluded in 1920, including four truss bridges. The completion of this section opens up 8½ miles of splendid scenery and makes the summit of Sinclair pass accessible to motor traffic. The scenic beauties of this district will make this one of the most attractive sections of the route. Among the interesting features are the wonderful upper Sinclair canyon, lake Olive and what is known as Red Bluff. One mile west of Sinclair summit there is also a viewpoint from which a magnificent panorama of the Kootenay valley can be obtained.

On the west end of the road grading work was also carried on by day labour from the end of the above section under contract to mile 13 from the Columbia valley road. During the winter months, clearing the right of way was undertaken at the west end of the road, and by March 31, 12 miles of the Kootenay section had been cleared. At the east end of the Banff-Windermere road, on what is known as the Vermilion section, 5 miles of new road were opened up during the summer months. The grading work at this end was very heavy and, owing to a lack of labour, progress was retarded. Clearing work was also undertaken on the Vermilion section during the winter months and on March 31 some nine miles had been completed.

Two truss bridges were constructed on this section during the winter, the larger over the Kootenay river at Kootenay crossing consisting of a 70-foot round timber truss. A 40-foot round timber truss was also constructed at Hawk creek and a good start made on a 140-foot bridge over the Vermilion river.

#### CASTLE-LAGGAN ROAD

The final 10½ miles of this important highway were completed at the close of the season and the road will be thrown open for traffic during the early part of the 1921 season. The completion of this highway has been anxiously awaited by eastern motorists. It opens up the beautiful Lake Louise and Moraine lake districts and gives access to Paradise and Consolation valleys, two of the loveliest valleys in the mountains, the latter of which affords good fishing in its lakes. The distance from Calgary to Lake Louise is about 110 miles and the trip can be easily made in seven hours. This makes it a week-end possibility from Calgary and other points in Alberta and a very heavy travel may, therefore, be looked for over this road in the near future.

#### MOUNT REVELSTOKE MOTOR ROAD

In Mount Revelstoke National park the construction of the Mount Revelstoke motor road was continued under contract under the supervision of the parks highway engineering division. Owing to a very late season and to a wet fall in this locality, less than two months of favourable weather was experienced and the work called for by the contract was not completed. It is expected that the remaining 1½ miles of work embraced by the contract will be completed in the season of 1921. The objective of the road is the summit of Mount Revelstoke where there are many hundred acres of open park-like country. The total length will be in the neighbourhood of 18 miles, of which 12½ miles have already been constructed.



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## BRIDGE CONSTRUCTION

Two large and important bridges were constructed under the supervision of the parks highway engineering division during the past year. One of these was a 290-foot wooden truss bridge over the Kickinghorse river at Field, Yoho park, to replace the old wooden bridge which had become dangerous to traffic. This bridge consisted of three spans and was constructed with a curved upper chord which adds much to its appearance. The total cost was \$13,500.

In Jasper park a new steel bridge of 150-foot span was erected over the Athabaska river at a total cost of approximately \$21,000. The concrete piers and the approach work were completed by day labour while the steel work was let out by contract. This bridge is to replace the old bridge over the Athabaska river on the road to Maligne canyon, which was in a very bad condition.

In addition to the above contract work several miscellaneous surveys were carried out by the engineering division, the most important of these being the reconnaissance survey of a motor road between Field and Golden. Some six miles of the road west of Field are already constructed and the reconnaissance made covered particularly that section between Leachcoil and Golden. This portion of the road follows through the famous Kickinghorse canyon and will necessarily be very high in cost. If constructed, however, it would be one of the most spectacular roads from a scenic standpoint in the Canadian West.

## PROTECTION OF ANIMAL LIFE IN THE PARKS

It may be of interest to note that the extension of our roads and trails system has an important bearing upon the question of game protection. According to reports received from the warden staff as soon as a road or trail is constructed into a new district the wild animals make use of it to come into the parks. Following the construction of the Transmontane highway over the Vermilion summit numbers of sheep and goat have been observed entering Rocky Mountains park via this roadway and it is noticed that all game in that part of the park has noticeably increased.

*Yoho Park made Sanctuary.*—The results of absolute protection have again been demonstrated in Yoho park where, owing to the agreement completed with the province of British Columbia, the parks' game regulations have been in force since January, 1920. Reports from the officers in charge of this park state that almost immediately an increase in many forms of wild life was noticeable. Bear, moose and deer roam the park at will and seem to know that no harm will befall them, while goat, grouse, ptarmigan and beaver are rapidly becoming more numerous.

*Increase in Other Parks.*—A similar steady increase is reported from the other parks. Sheep are to be seen almost constantly on Sofa mountain near the townsite of Waterton Park and beaver are becoming very numerous. In Jasper park, in addition to the continued increase in big game, the superintendent reports that valuable fur bearing animals such as beaver, fisher, marten and mink are evidently greatly on the increase.

*Elk.*—The elk, or wapiti, procured from the Yellowstone National park, Wyoming, and liberated in Rocky Mountains and Jasper parks have done well. The chief game warden of the former park reports that all the animals seen are in fine condition and that there is a large percentage of young in the herd. The chief game warden of Jasper park reports a similar increase and states that no dead have been found since June 1, 1920, indicating that, except for the few which were injured in shipment, the herd has adapted itself to its new environment and is now in a



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thriving condition. There is, therefore, good reason to believe that the areas within the parks suited to elk will again soon become stocked with these magnificent members of the deer family.

*Antelope.*—The antelope herd in the fenced enclosure at Nemiskam, Alta., continues to thrive, and the caretaker reports that a number of fawns were noticed among the herd this spring. Only one dead was found during the year. This was a young buck, thought to have been killed while fighting. While it has been impossible to secure an accurate count of the number, it is believed that there are upwards of 100 now in reserve, an increase of over 60 since the herd was enclosed.

So far as is known this is the most successful experiment yet made in breeding antelope in captivity, and the satisfactory results attained lead to the consideration whether the policy should not be further extended. According to reliable reports there are no antelope left in Manitoba today. In Saskatchewan they are fast disappearing. One of the last large herds in Canada, and in fact on the continent, is to be found in Alberta, in the "bad lands," within a radius of about 30 miles from the town of Brooks. Recent reports indicate that there are probably 300 antelope scattered among the sand hills in this locality. The land is said to be absolutely worthless for agricultural purposes and cannot be irrigated. It consists of a succession of sand hills running back into deep coulees, which afford the antelope good shelter in storms. The creation of another reserve in this section would not be a difficult matter and it is, I believe, the only means of saving this last herd from extinction. Judging from the rapid disappearance of the antelope in Western Canada during the past fifteen years, there will not be a single wild antelope left in Canada in a very few years. If this interesting native animal is to be preserved for posterity, action will need to be taken at once.

*Buffalo.*—At the close of the fiscal year the Government buffalo herds number 5,152 in Buffalo park, Wainwright, Alta., and 230 in the Elk Island park, Lamont, Alta., with 11 in the Buffalo exhibition herd at Banff, or a total of 5,393 in all. The proportion between the sexes is now about even, which means that there are about 1,000 more males in the herd than are required to maintain it in its best condition. The question of the best disposal of the surplus animals has been under the consideration of the department, and it has been decided during the coming winter to slaughter about 1,000 males and to dispose of the meat, heads, and hides. Buffalo meat is as tender and palatable as the best beef and a market should be readily found for it. A very considerable revenue should also be secured from the sale of the heads and hides. During the past season the question of corrals, sorting pens, and receiving pastures necessary in connection with the scheme has been carefully gone into and provision has been made in the estimates for the work being undertaken during the coming year, including the construction of a building for storing and handling the meat during the winter months.

If the herd continues to thrive as it has done in the past, it is believed that the department will have 1,000 surplus buffalo to dispose of every two or three years and I think we may confidently look forward to securing a revenue which will in a few years have paid for the total expenditure on the buffalo, including purchase, fencing of park and maintenance, while still maintaining the herd at about 6,000 head. The future revenue from these, deducting the cost of maintenance, will then be clear gain.

#### PARK FARMS

The policy of the growing of feed within the parks for park animals continues to justify itself and is the means of a considerable annual saving to the department. Farms are now maintained in Elk Island, Rocky Mountains, Waterton Lakes and Buffalo parks. The season's operations in the first three consisted of the following:—



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PARK FARMS—*Continued*

## Green Feed—

## Hay—

Headquarters.....	65 tons.
District No. 1.....	9.63 tons.
	<hr/>
	74.63 tons

## Green Feed—

Headquarters.....	39 loads 7,800 sheaves.
District No. 5.....	8 loads 1,600 sheaves.
	<hr/>
	47 loads 9,400 sheaves.

Elk Island Park.. . . . 350 tons hay

Rocky Mountains park.. . . . 102 tons of hay cut on shares system.

The most extensive farming operations are carried on at Buffalo park, where there is a farm of about 600 acres. This park has about 100 horses, and in good seasons the crop is sufficient not only to supply all the requirements of the park but also to allow shipments of hay and oats to other Dominion parks. During the past season about 400 acres were put to oats and 200 summer-fallowed. The crop, which was almost double that of the preceding year, totalled 12,450 bushels of oats, 250 tons of straw and 900 tons of hay. The problem of conserving the fertility of the soil at Buffalo park has been the subject of a good deal of consideration. As the needs of the parks' service only call for oats, the usual practice of rotating crops is not practicable. By summer-fallowing 200 acres each year and putting the remaining 400 to crop, up to the present good results have been obtained. But if an enriching crop such as clover or rape could be got to grow in conjunction with the oats no doubt the yield would be increased. Unfortunately the true clover, which does so much for the fertility of farms in the East, will not thrive in the Buffalo park district. During the past two years experiments have been made in growing rape with the oats. These have not been very successful, but it is hoped with deeper ploughing and a favourable season better results will be obtained this year. An experimental plot of 5 acres is also being seeded with sweet clover to see if this species can be made to grow in the district.

## GRAZING

The dry summer of 1919 proved so destructive to the natural browse in Waterton Lakes park that in order to protect the wild life it was decided to considerably restrict the number of grazing leases. Leases covering the grazing of about 1,900 head were granted during the year, as compared with 2,900 the previous year. This allowed the vegetation to recover itself and an amply supply of food was available for the wild life during the winter season.

Grazing permits in the national parks are limited to cattle and horses. The question of permitting sheep to graze in the parks did not arise until 1918, when applications were received from sheep owners in the neighbourhood of Waterton Lakes park. After carefully considering the question, the department was convinced that the presence of sheep threatened the purpose for which parks are fundamentally established, namely, the preservation of certain areas in an absolutely natural condition, including the native fauna and flora, and for this reason it was decided to ban sheep definitely from park areas. As is well known, sheep by reason of their close-cropping habits are excessively destructive to shrubs and plant life which form the browse of cattle and wild animals such as deer and elk. The unhappy results pointed out by Prof. Henry Fairfield Osborn, President of the American Museum of Natural History, New York, following sheep grazing in the country lying between Arabia and Mesopotamia, confirm the fears with regard to the dangers of grazing sheep on semi-arid lands. "I am convinced," he says, "that this country, formerly densely populated, full of beautiful cities, and heavily wooded, has been transformed less by the



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action of political causes than by the unrestricted browsing of sheep and goats. This browsing destroyed first the undergrowth, then the forests, the natural reservoirs of the country, then the grasses which held together the soil, and finally resulted in the removal, by erosion, of the soil itself."

During the past year the question has been brought up in a new form by the receipt of applications from stockmen to drive sheep across Waterton Lakes park to grazing lands in British Columbia. After carefully considering the matter, the department decided that such permission would be a serious detriment to park interests unless the applicants agreed to fence the route on both sides through the park. Up to the present no applications for the necessary permission have been received.

#### FISH AND FISHING

The fishing in the parks on the east slope of the Rockies constitutes an important attraction and the good results obtained from the restocking of the lakes and streams are now widely evident. During the month of July about 1,000 pounds of trout and Rocky Mountain whitefish were taken in Rocky Mountains park, in addition to 800 pounds of Great Lake trout from lake Minnewanka, and 6,300 pounds in all in the month of August. In Waterton Lakes park the fishing is always exceptionally good. Last season a record catch of a 51-pound trout was made by a lady visitor who succeeded in gaffing and landing the fish by her own unaided efforts. The question of amendments to the fishing regulations so as to further protect this valuable resource is now receiving consideration.

#### FOREST PROTECTION

The season of 1920 was a very dry one in the parks and constant vigilance with regard to forest fires was necessary. While a number of fires were started, in the great majority of cases, owing to the prompt action of the warden service and the improved equipment with which all the parks are now provided, damage was restricted to a few acres. The following is a statement of the number and causes of fires and estimated damage:—



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Name of Park	Campers or Smokers	Railway	Unknown	Lightning	Other causes	Total	Areas burnt over (acres)			Cost of extinguishing			Fires Grand total
							Merch. timber	Dead and cordwood	Young Reprod.	Grass	General	Railway	
Rocky Mountains—													
Over 10 acres .....	5			1		6	1,665		2,056	\$ cts. 10 30	\$ cts. 4,413 66	\$ cts. 11 50	\$ cts. 4,425 46
Under 10 acres .....	17	8	1	1	1	25							
Total.. ..	22	8	1	2	1	34							
Jasper—													
Over 10 acres .....	1	5				6	41	44	12	98 02	394 50	445 72	840 22
Under 10 acres .....	6	34			1	41							
Total.....	7	39			1	47							
Waterton Lakes—													
Over 10 acres.....	1					1					50 70		50 70
Under 10 acres.....	1					1							
Total .....	1												
Yoho—													
Over 10 acres .....	1	1		3		1	500	2 75		0 25	614 96	6 00	620 96
Under 10 acres .....						4							
Total.. ..	1	1		3		5							
Glacier—													
Over 10 acres .....		1		2		2	1,450	202			1,648 59		1,648 59
Under 10 acres .....				3		4							
Total....		1		5		6							
Kootenay—													
Over 10 acres.....	1					1							Nil.
Under 10 acres.....	1					1							
Total.. ..	1												
Mt. Revelstoke....						Nil.							Nil.
Buffalo.....													
Elk Island.....													
Totals. . . . .	32	40	1	10	2	94	3,686 acres	248 75 acres	2,068 acres	178 57	7,122 41	463 52	7,585 93



The great success which has attended the use of the portable fire units developed by the Parks Branch a few years ago suggested the development of a larger engine for use in connection with fires along our motor roads and, in September, a three-quarter ton Reo chassis, with hose body and pressure pump, capable of delivering 130 gallons per minute at 120 pounds pressure, and equipped with 2,000 feet of 2½-inch hose and two play pipes, was sent to Rocky Mountains park for fire fighting purposes. The trial tests of this engine showed that it surpassed even our expectations and I believe it will prove of very great assistance in forest protection work. The fact that a large proportion of park fires are caused by engines and that the motor road parallels the railroad for a great part of the way through the park will make it possible to utilize this engine in connection with a large percentage of the fires that break out.

New construction in connection with the forest protective system during the year was as follows:—

Name of Park	Tele- phone Mileage	Cabins	Trail Mile- age	Stables or Barns	Speeder Houses	Shelter	Well for Fire Units Supply	Equip- ment Store- house	Fire Unit Garage
Rocky Mountains	39½	2	49	2	1			1	1
Jasper	4	4	4	4					
Waterton Lakes.....	8½	2		2					
Glacier	1½		15½	1					
Yoho	6	2	6	3	1				
Kootenay	29	1		2					
Mt. Revelstoke		1	3½	1					
Buffalo		1							
Pt. Pelee						1	1		
Elk Island									
Totals.....	88½	13	78	15	2	1	1	1	1

An additional assignment of 10,000 pipe protectors, which very effectively prevent sparks from pipes setting fires in dry places, was purchased in June, 1920, for distribution among visitors to the various parks.

PARKS PUBLICITY

For the first time since 1914 a small appropriation was available for publicity purposes and it was possible to undertake the re-publication of some of our parks pamphlets as well as the issue of some new ones. These were urgently required as owing to the steady demand for information practically all our editions were on the verge of exhaustion. A new edition of "Glaciers of the Rockies and Selkirks," an attractive monograph on glacial formations by Prof. A. P. Coleman, of Toronto University, which has proved very popular, was put in hand as well as a new and revised edition of "Guide to Fish and their Habitat in Rocky Mountains Park." Considerable new data has been added to the latter and it is being enlarged so as to cover the fishing waters of the three parks on the eastern slope of the Rockies all of which contain the same species of game fish. Material for a new descriptive booklet on the parks through the central Rockies and Selkirks along the main line of the Canadian Pacific Railway was also prepared and is now in the hands of the printer. A small folder "Where to go and what to see at Banff," another on Golf at Banff and a folder to be distributed in connection with some coming European exhibitions are now in course of preparation.

A unique souvenir which has attracted considerable attention was issued in connection with the forest protection educational campaign. This was a small



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aluminum luck charm called "Buffalo Medicine," enclosed in an attractive paper facsimile of an Indian pouch. An enclosed leaflet related the Indian legend connected with the charm and made the forest protection appeal in an unusual way. Ten thousand of these souvenirs were distributed but the demand for them has been so great that a new edition will probably be issued in the near future.

Another attractive device in connection with the same campaign was the issue of automobile stickers designed to be attached to the windshields of cars entering the parks where they will serve as a constant reminder with regard to fire. The design chosen for Rocky Mountains park was the head of a Bighorn, for Waterton Lakes park, a Dolly Varden trout.

Splendid publicity was given the Canadian parks at the International Alpine Congress held at Monaco in May. Mrs. Julia Henshaw, author of "Wildflowers of the Canadian Rockies," and Mr. Byron Harmon, the well-known mountain photographer, were the Canadian representatives and they took with them a number of very fine park films loaned by the Exhibits and Publicity Branch of the Department of Trade and Commerce as well as a collection of about fifty sepia enlargements of striking park pictures. The Canadian programme proved of such interest that it was twice repeated, once at the special request of the Prince of Monaco himself. At the close of the congress the President, Baron F. Gabet, addressed a letter to the Canadian officials thanking them for their participation and stating that Canada's share in the congress had been "the most brilliant and the most important whether from the point of communications presented or of exhibition." As the congress embraced representatives from all the Alpine organizations of the world, the attractions of the Canadian Rockies as a new field for alpine work were brought to the attention of thousands of climbers and I have no doubt that Canada will benefit largely from this publicity. At the conclusion of the proceedings permission was granted to present the exhibit of enlarged photographs to the Club Alpin Francais where they will serve as a valuable and permanent advertisement of the Canadian mountains.

The demand for the loan of motion picture films, lantern slides and half-tones of park scenes is increasing from year to year. The Exhibits and Publicity Branch of the Department of Trade and Commerce have now seventeen films on their list depicting national parks subjects. These films are in almost constant circulation and form one of our best mediums of publicity. The Parks Branch also has about 500 coloured slides of birds, animals, flowers and scenery which are in almost constant circulation. During the year slides and lecture notes were furnished to several well-known speakers who were giving a course of lectures in Great Britain and Europe and wished to include a lecture on the Canadian National parks. While the Parks Branch has at the present time no official lecturer, a considerable number of addresses were given voluntarily by members of the branch.

A greater demand from Canadian magazines and newspapers for articles, photographs and material with regard to the national parks was evidenced than ever before, indicating that the Canadian public is beginning to take a more active interest in these great national possessions. A number of well known magazine writers were furnished with the necessary data and illustrations for articles on various phases of the parks and their work. These articles appeared in some of the prominent English and American periodicals.

A delegation of the Imperial Press Association comprising nearly 200 journalists from all parts of the Empire, with their wives and daughters, toured Canada during the summer and visited a number of the national parks. Although their stay in each was necessarily short the extent and beauty of these great reservations made a deep impression on the members of the party and after their return many articles appeared in their respective journals in praise of the attractions of the Canadian parks and appreciation of the ideals behind them.



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## WALKING TOUR CAMP

A new way of seeing the Rockies was made possible last summer by the inauguration of the so-called "Walking Tours." These were organized by Mr. A. O. Wheeler, the energetic director of the Alpine Club of Canada, and were intended not only to stimulate the healthful art of pedestrianism but also to make it possible for people of limited means to enjoy a holiday among the mountains at moderate expense. As is well known, some of the finest and most spectacular scenery in the parks lies out along the trails, remote from railways, and hitherto it has been open only to those wealthy enough to afford the expense of a pack train. The objective selected by Mr. Wheeler was mount Assiniboine, the highest and perhaps the most beautiful peak in Rocky Mountains park, which lies about 20 miles south of Banff in a direct line or about twice as far by trail. The surrounding district is a very fine one and the route to the peak lies through alpine scenery of great beauty. A headquarters camp equipped with large dining and living tents and small tents for sleeping and in charge of a competent staff, was established on lake Magog directly below the magnificent massif of Assiniboine and parties under the protection of experienced guides left Banff each day for the camp during the camp season. The trip was timed to cover from two to three days and ponies were available for those who found the walk too fatiguing. Two in-between camps were also established at the end of each day's march—Sunshine Camp, 12 miles from Mount Edith landing, and Golden Valley Camp. These were also fully equipped so that touring or fishing parties could remain as long as they desired. About 275 visitors travelled over the route during the weeks the camp was in operation. Among these were several publicity men including the official photographer of the Canadian Pacific Railway, a representative of the Chester Production Company, and Mr. Branson de Cou, the well-known lecturer of New York, all of whom secured some excellent pictures. It is expected that the camp will be continued during the coming season and if the scheme proves a success the intention is to extend the policy to other parts of the park.

## AIRSHIPS AT BANFF

An application was received during the year from the Rocky Mountains Aviation Transport Company, Limited, for a lease of land at lake Minnewanka and at the second Vermilion lake for a sea-plane harbour. The company plans to operate a sight-seeing aeroplane system to enable visitors to view the Rockies from the air. Passengers will be taken up to a height of 2,000 or 3,000 feet which will afford a wonderful panorama of the ranges but no attempt will be made to cross the high peaks. In view of the attraction of such a service to summer visitors the application was favourably considered and a suitable area will be selected on each of these lakes for a landing and taking off place and marked off with buoys and signs so that boating parties will be protected. The intention is to use the second Vermilion lake during the first part of the season but if its waters become too shallow during the height of the summer to utilize the landing place at lake Minnewanka. Plans for the construction of a hangar at the latter lake are also being considered.

## WATERTON LAKES PARK

The rapid development in the service which this park is furnishing to the public is a matter for much satisfaction. During the past three years the number of visitors has more than doubled, largely as a result of the improved condition of the roads to and within the park. The demand for lots for permanent summer homes has also been heavy. All indications point to this becoming one of the most popular of the Dominion parks in the near future. The fishing is unexcelled, the scenery as beautiful as any to be found in the Rockies with a character distinctly its own. Towards the close of



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the fiscal year Mr. W. Thomson, golf professional at Banff, was sent to Waterton Lakes park to lay out the course for a new nine-hole links. Mr. Thomson selected an area about a mile and a quarter from the townsite of Waterton Park on a high bench overlooking the Waterton lakes. He reports the site admirably adapted for the purpose, with fine sporting hazards, a good natural turf and wonderful scenery. Work on the course will be carried on immediately and it is hoped to have it ready for play before the close of the season.

## JASPER TOWN PLAN

A preliminary plan of the proposed development of Jasper townsite was furnished early in the summer by Mr. Thos. Adams, Town Planning Adviser to the Commission of Conservation. Mr. Adams visited Jasper in May, accompanied by Mr. A. G. Dalzell, Engineering Assistant, and investigated the question of water supply and drainage in a preliminary way and also drew up a sketch of the proposed plan of extension of the street system and made recommendations with regard to a suitable hotel site. Such a plan will be of great value in the future development of the town and Jasper is fortunate in having practically no existing construction which will interfere with the carrying out of such a scheme from the beginning. Before it is finally adopted, however, some additional survey work will be necessary to secure complete data with regard to levels, drainage, etc., a work which it is hoped the Surveyor General's Branch will be able to undertake early during the coming year.

## ARTISTS' AND AUTHORS' COLONY

Miss Agnes Laut, the well-known Canadian author, has selected an area in Jasper park on the shores of lake Edith, on which she proposes to form a colony of authors, artists and professors, a number of whom will come from New York to spend their summer amid the inspiring scenery of the park. Plans for several of the proposed bungalows have been approved by the department and three of these are now under construction.

## AIR-FLIGHT STATION IN JASPER

Jasper park was one of the landing stages in the transcontinental air-flight from New York to Alaska successfully carried out last August under the command of Capt. Street. The site selected was near old Henry House, about 10 miles from Jasper townsite, and according to reports published by the air men it proved one of the best landing places encountered in the trip. Its one drawback owing to its distance from Jasper is the difficulty of forwarding supplies and it has therefore been decided to make provision for a permanent landing place within the town itself. A suitable area has been selected and will be included in the proposed Jasper town plan.

## WAR TROPHIES

Through the courtesy of the War Trophies Commission a number of captured guns were allotted to the Parks Branch and have been placed in Dominion parks in different parts of the country. It is felt that the parks are a very appropriate place for these trophies in view of the large number of people from all parts of Canada as well as other countries who visit them each year. One German 77 M. gun was placed at Jasper, one gun and two machine-guns at Banff, one gun and two machine-guns at Fort Anne and one gun at Fort Chambly.

## IRRIGATION PROJECT

A scheme which would have had a serious bearing on the future of Waterton Lakes park came up for discussion during the year. This was a proposal submitted by the Superintendent of Irrigation for the utilization of the waters of Upper Waterton



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lake for irrigation purposes in southern Alberta. The scheme involved the building of a 40-foot dam at what is known as "The Narrows" and the creation of a storage reservoir of over 100,000 acre feet. The resulting elevation of the water level would have caused serious damage to the park, including the flooding of the townsite of Waterton Park, the park's headquarters. After going more fully into the matter, however, the Irrigation Branch decided that the plan would involve a very heavy expenditure and that its undertaking was not feasible at the present time. The matter is therefore being held in abeyance.

Applications for private interests for water-power rights in other parks have also come before the department during the past few years. The stand taken by the Parks Branch with regard to such applications is that the parks are the property of all the people of Canada and that consequently they should not be developed for the benefit of any one section of the country or of private interests; second, that such development constitutes an invasion of the fundamental principles upon which parks have been established, namely, the conservation of certain areas of primitive landscape with all their original conditions of plant and animal life and other natural features intact. National parks are in reality natural museums of undisturbed nature. As time goes on they will probably be the only places which will present a perfect picture of natural conditions such as existed when the white man first came to this continent. The national parks from this aspect are valuable now but they will be many times more so 100 years hence when probably every part of the country will have been settled. Moreover the national parks contain only a small proportion of the water resources of the country and, so long as other sources can be developed, to injure or destroy the recreational values of the parks might be an economic policy of the poorest kind. The Director of the United States Parks estimates that the value of the travel which annually goes to Niagara to view the great spectacle of the falls is worth from \$30,000,000 to \$40,000,000, while, he says, it has been estimated that Niagara developed as electrical horsepower, at the rates charged at present in a wholesale way, could at the most produce less than \$15,000,000 a year.

In previous reports I have shown that the foreign tourist traffic to our oldest national park—Rocky Mountains—has been estimated to be worth not less than \$15,000,000. This is a revenue which is increasing annually. I look forward to its becoming in time \$30,000,000 a year. Unless power development could be carried on without damaging the scenic values of the park it would, I think, be poor policy to endanger such a potential revenue. The following extract from a letter from Albert B. Fall, Secretary of the Interior, Washington, to Hon. Chas. L. McNary, Chairman of the Committee on Irrigation and Reclamation, United States Senate, with regard to the proposed Walsh Bill for power development in Yellowstone park, gives the statement of his policy with regard to the United States National Parks, a policy which I think might well be adopted in this country:—

"I cannot favour the enactment of the measure. I do not believe it would be advisable for Congress to permit private interests to develop irrigation or power sites within the limits of existing national parks. These parks were created by Congress for the preservation of the scenery, forests, and other objects of beauty and interest in their natural conditions, and they are created and maintained for general and national purposes as contradistinguished from local development.

If cases be found where it is necessary and advisable in the public interest to develop power and irrigation possibilities in national parks, and it can be done without interference with the purposes of their creation, I am of the opinion that it should only be permitted to be done, whether through the use of private or public funds, on specific authorization by Congress, the works to be constructed and controlled by the Federal Government."



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## EXTENSION OF PARKS POLICY

The growing appreciation of the value of national parks and their increasing use by the people serve to emphasize not only the need for preserving the parks we already possess but for an extension of the policy to meet the needs of the whole country. The parks as they are today will unfortunately for geographical reasons always be beyond the reach of many thousands of Canadians. Yet the things the parks have to offer are needed by all sections of the people, and nowhere more so than near our large centres of population. The increasing strain and complexity of city life make the necessity for recreation, change, escape into a simpler environment, greater each year. The mile-a-minute existence of the modern city forces us too often to run 20-horsepower human engines at a 40-horsepower speed. The result is an increasing number of nervous and mental breakdowns. The figures for insanity and organic diseases, due to deficient vitality, have been steadily rising during the last quarter of a century largely owing, it is said, to overstrain and monotonous conditions of labour. Recent experiments show that fatigue, even fatigue from purely manual labour, is more a matter of the brain and spinal cord than of the muscles, that capacity for work depends on nervous energy and that that capacity is increased by rest and recreation. Tests worked out by Dr. Stanley Kent, in connection with his studies on munition workers in England, showed that capacity for work or what is called "reaction power," that is the ability of the nerves to respond, the quality of "snap" or the capacity to think quickly, to make prompt decisions, was highest on Monday after the week-end holiday and lowest after overtime work, while on Saturday which was a half-day with the prospect of the holiday ahead, the men finished with the same capacity for work as when they began. These experiments, carefully carried out as they were, go to show that unless provision is made for adequate rest and recreation, there must be a gradual lowering of the nervous system and consequently of the capacity for work, resulting finally in a weakening of the general vitality. After the enormous sacrifices that have been made for the safety of the country the conservation of the vitality of the race is surely a question of first importance and no means of preserving or increasing that vitality should be neglected. It is in this connection that national parks become valuable. The city worker, in addition to his long hours of monotonous labour, has too little sunlight, air and freedom. Life in the crowded anthills of our great cities exhausts nervous energy. Contact with nature, escape into the freedom, solitude and the ample spaces of the country is often a positive need. And it must be nature in her wildness rather than the cultivated nature of the city park.

Leon Rosenthal in his recently published *Villes et Villages Français après la Guerre*, writing of the increased need of parks for the workers, says: "The simple aspect of the country is not enough for him. He craves a suggestion of the wildness of mountain scenery, the calm of the lake, the turbulence of cascades," and Mr. Rosenthal is asking the French landscape architect to create these artificially to meet what is apparently an instinct on the part of the worker. Fortunately on this continent there is no need to resort to artificiality. There are areas still within easy reach of all our large cities which could be procured and set aside as national parks where nature is practically undisturbed. The benefits which would result would be incalculable. Indeed I am convinced that the expense involved would be paid for by our unused gaols, asylums and hospitals within a comparatively few years and we should at the same time be building up a healthier, happier and better citizenship by bringing the life of nature back into the life of the masses. It has been said that Great Britain's notable series of contributions to civilization are "bounded on the east by the Magna Charta and on the west by the week-end". The statement was no doubt made humorously but it is scientifically true that the habit of recreation and change which has been adopted by the British people as a whole has done much



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to add to the general well-being and happiness as well as the capacity for labour. The creation of national parks within easy access of our great cities where thousands of workers could spend the week-end camping and fishing would result in human dividends worth many times the capital invested.

## HISTORIC AND PRE-HISTORIC SITES

Good progress has been made with the work of the preservation of historic sites of national importance during the year. The Historic Sites and Monuments Board, which acts in an advisory capacity to the Government in connection with this work, has held to date two general and five local meetings. In view of the large field to be covered and of the great number of places of historic interest throughout Canada, it was recognized that before undertaking any extensive preservation or marking, a Dominion-wide historical survey was necessary to collect information with regard to all existing sites and to decide which of these were of national importance. This survey has been carried on during the year by the members of the board, each of whom is a specialist in his own division of Canadian history. The co-operation of thirty-four historical societies and associations interested in the preservation of Dominion landmarks has also been secured. To date 547 sites have received the attention of the board and 46 have been selected to receive attention. Action with regard to a number of these has been taken as follows:—

### MARITIME PROVINCES

*Louisbourg, N.S.*—Ruins of old French fort, built in 1720-40, once the stronghold of France at threshold of continent, played an important part in the events which led to withdrawal of French rule from Canada. This was one of the first sites to receive the attention of the board. An official of the Parks Branch was detailed to make an investigation and report and steps were taken to secure title to lands on which the ruins of the old fort stand.

*Fort Edward, Windsor, N.S.*—Formerly old French fort Piziquid, which came into possession of the British soon after the establishment of British power at Halifax, 1749, and was used for many years for defensive purposes against the Indians and Acadians. The barracks and original blockhouse intact. Controlled by Militia and Defence Department. Previously under lease to town of Windsor. Protective clauses concerning the historic buildings have been inserted in the new form of lease, to be signed.

*Fort Moncton, about one and a half miles from Fort Elgin, N.B.*—Formerly old French fort Gaspereaux. Erected by the French about 1750 at Bay Verte, to command defence of the Isthmus of Chignecto against the British. Captured in 1755 by the British. All that remains is the square of trenches. There are old grave stones, and the ancient turnpike and causeway across a tract of marsh as well as the contour of the walls can be ascertained without difficulty. It is proposed to erect a cairn and tablet. The site is privately owned and the consent of owner to sell has not yet been obtained.

*Fort Cumberland, about four miles from Amherst, N.S.*—Formerly old French Fort Beausejour, erected about the middle of the seventeenth century for protection against the English in the vicinity of Beaubassin, one of the most important French Acadian settlements, near the site of the flourishing town of Amherst. Captured in 1755 by British forces and village destroyed. Named Fort Cumberland in honour of Duke of Cumberland, son of George III. The ruins are still



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visible in the shape of a pentagon or fort of five bastions, which once mounted thirty or forty guns of large calibre, also ruins of the old barracks. The casemates were very recently in a fair state of preservation having been built of solid brickwork. Action has been taken to have the ruins fenced and preserved from further deterioration.

## QUEBEC

*Hochelaga, Montreal, P.Q.*—Site of the Indian town of Hochelaga on present grounds of McGill University. The University authorities have consented to allow the placing of a monument and tablet of suitable design.

*Fort Crevier, St. François du Lac, P.Q.*—Built in 1687-1714, as a protection against Indian attacks. A tablet and cairn have been recommended as soon as the necessary land can be secured.

*Battle of Repentigny, P.Q.*—To commemorate battle against Iroquois, June 7, 1691, in which a number of Canadians, including Lemoine de Bienville, were killed. A cairn and tablet are recommended and steps are being taken to acquire site.

*Second battle of Laprairie, near Laprairie, P.Q.*—To commemorate military operations which took place on same day as the first battle of Laprairie, between the French militia and the New England States militia. A cairn and tablet have been recommended.

*St. Maurice Forges, near Three Rivers, P.Q.*—The Forges were established in 1730 and operated until 1880, under both English and French regimes. There are only ruins left, which will not permit the placing of a tablet thereon. Permission has been granted by the Bishop of Three Rivers to place a tablet on the church, which is on the Forges site.

*de la Verendrie, Three Rivers, P.Q.*—To commemorate the birthplace of Sieur de la Verendrie, discoverer of the Northwest Territories. The site on which the house was situated, which is in a beautiful park, has been given by the city of Three Rivers. A cairn and tablet are to be placed there.

*Battle of Three Rivers, P.Q.*—To commemorate military operations in 1776 against the Americans. Cairn and tablet recommended. Owner of land has consented to donate the site.

*Chateauguay, Allan's Corners, P.Q.*—Area, .25 acres. A monument was erected on this site in 1895 by the Dominion Government to commemorate the battle of the 26th of October, 1813, between the Americans and British. The site which is fenced and in a good state of repair has been transferred by the Militia Department to the Parks Branch for historic memorial purposes.

*Fort Lennox, Isle aux Noix, P.Q.*—One of the forts which formed the line of defence in the Richelieu valley. Remains consist of earthworks and a number of well preserved buildings. The Department of Militia and Defence has agreed to the transfer of the whole island with five other small islands, covering in all 250 acres, for historic memorial purposes.

*Fort Chambly, Chambly, P.Q.*—The fort was built of palisades in 1665; burnt by Iroquois in 1702. Rebuilt of stone 1709-1711. Taken by the Americans in 1775, and interior buildings burnt in 1776. Restored in 1777; abandoned definitely in 1850. The present ruins consist of three well preserved outside walls and the old cemetery, containing 2.16 acres. This site was handed over recently by the Militia and Defence Department to this department.



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## EASTERN ONTARIO

*Old Simcoe Building, Kingston, Ont.*—Where Lord Simcoe held his first Executive Council in 1792. It is reported that the house has been removed from its original site. Matter being further considered.

*Glengarry House, near Cornwall, Ont.*—Site of the residence of Lieut.-Col. John McDonnell, a noted pioneer in the settlement of the province. First speaker of the Legislative Assembly of Upper Canada. Ruins of residence left. Cairn and tablet recommended when site is secured.

*Windmill Point, Prescott, Ont.*—To commemorate the victory over invading force of Filibusters, November 11-13, 1838. The windmill is now being used as a lighthouse by the Marine and Fisheries Department and the placing of a tablet has been allowed by that department.

*Chrysler's Farm, Dundas County, Ont.*—Area, .23 acres. A monument was erected here by the Dominion Government in 1895, to commemorate the victory over Americans at the battle of Chrysler's Farm, November 11, 1813. This site has been recently transferred from the Militia and Defence Department to this department.

## WESTERN ONTARIO

*Southwold Earthworks, near St. Thomas, Ont.*—This site containing the Southwold Earthworks is the best example of aboriginal earthwork in Ontario, if not in Canada. It is identified at the Neutral Indian village called St. Alexis, probably built before 1650. It is recommended that 25 acres be purchased surrounding the earthworks for preservation and park purposes, although the site of the works only actually covers 2½ acres. The site is privately owned.

*Port Dover, Ont.*—(Site of the Cross) "*Cliff Site.*" The site is situated on a cliff, near the mouth of the river Lynn, overlooking lake Erie. The Sulpician Fathers Dollier and Galinée, near here, on March 23, 1670, erected a cross, with the Arms of France, etc., and claimed sovereignty in the name of King Louis XIV over the lake Erie region. It is proposed to erect a cross in cement, to place at the base thereof a tablet with a suitable inscription, and on either sides of the base to attach plates reproducing the original proces-verbal in French and in English, with the arms of France over these. "*Wintering site.*"—This site is about three-quarters of a mile from the mouth of the river Lynn. Here in 1669-1670, the above Sulpicians and seven other Frenchmen, the first Europeans known to have ascended the Great Lakes to Sault Ste Marie, wintered. Earthen mounds are the only remains of their hut, which served for residence, chapel and fort. A cairn with a tablet and fence is proposed.

*Sault Ste. Marie, Ont.*—Site of the old lock at Sault Ste. Marie constructed by the Northwest Fur Company in 1797. Part of the old lock has been restored. The erection of a monument with a tablet is recommended. The owners of the site will allow the placing of a monument.

*Mission of Ste. Marie I, on the Wye, near Midland, Ont.*—This site, a fortified mission built by the Jesuits in 1639 and occupied for ten years, consists of a stone fort and other works. The missionaries were forced to burn and abandon the mission on account of the Iroquois persecution. The owner of the site wrote to the effect that he did not wish to dispose of the property at present but would allow the department to carry on restoration work. The erection of a monument with tablet and restoration work is proposed.



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*Mission of Ste. Marie II, on Christian Islands, near Penetanguishene, Ont.*—This is the second fortified mission built by the Jesuits in 1649 after the burning of Ste. Marie I, on the Wye, above referred to and occupied from 1649 to 1650. It is situated on Christian island, which is an Ojibway Indian Reserve. The Indians by a resolution have allowed this department to fence the site, erect a monument with tablet thereon and carry on certain restoration work, as recommended in a report made by an officer of the department who visited the site.

*Mission of St. Ignace, Township of Tay, Simcoe County, Ont.*—This is the probable site where the Jesuit missionaries Breboëuf and Lalement were tortured and put to death by the Iroquois in 1649. The owner of the land has consented to transfer the site with a right of way thereto gratuitously to the department. The erection of a monument with a tablet and the construction of a fence is recommended by an officer of the department who visited the site.

*Niagara Front, Ont.*

The historic places on the Niagara front, extending from lake Ontario to lake Erie, have already been fairly well marked, with the exception of a few sites. In order to complete the marking of this front, it was recommended that the following sites were of national importance and should be dealt with.

*Chippewa.*—Site located in an open field on south side of river, in front of Laura Secord's cottage. Battle July 5, 1814, between United States and Canada. More British soldiers were killed at Chippewa than in any other engagement in the war. It is proposed to place a tablet on a monument constructed by the Niagara Falls Park Commission.

*Frenchman's Creek.*—Landing place of Fenian Raiders, May 31, 1866. On this site was fought the action of Frenchman's Creek, November 27, 1812, between the United States and Canada. Several non-commissioned officers and men of the Royal Artillery, 49th Regiment, and Norfolk Militia were killed in this action.

*Vrooman's Battery.*—This site is situated on private property, below Queenston on the left bank of the river, near the house formerly owned by Solomon Vrooman. The battery was employed in the Battle of Queenston Heights, October 13, 1812. The gun mounted here fired 112 rounds on that day.

The Niagara Falls Park Commission has consented to erect the monuments on these three sites, provided the department supplies the tablets, an offer which it is proposed to accept. The monuments will be prominently placed.

*Battle of Cook's Mills.*—This site is situated on Lyon's Creek road near the town hall of the township of Crowland, about three miles east of the city of Welland. Here was fought the Battle of Cook's Mills on October 19, 1814. Several non-commissioned officers and men of the 82nd, 100th, and 104th Regiments and Glengarry Light Infantry were killed in this action.

*Battlefield of Fort George.*—This site is situated on the Lake Shore road, near Two Mile creek, some distance outside the limits of the town of Niagara. An action was fought here on May 27, 1813, which resulted in the capture of Fort George by the Americans.

*Battlefield of Beechwoods or Beaver Dams.* Site located on the Mountain road, in the township of Stamford, near the town line between Thorold and Stamford. A battle took place here on June 24, 1813.



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*Battlefield of Ridgeway.*—Site located at the junction of the Garrison and Ridge roads, near Niagara. Here was fought the action on June 2, 1866, between a force of Canadian Militia composed of the Queen's Own Rifles, 13th Regiment, York and Caledonia Rifles, and a body of Fenians.

It is proposed to erect monuments with tablets on the four above-mentioned sites, when the necessary areas have been secured.

*Site of Tête du Pont Battery.*—This site is located on the little island (Hog island) at the mouth of Chippewa river. The battery was utilized for defence of the line of Chippewa creek, during September and October, 1814.

*Weishuhn's Redoubt.*—This site is located on private property on the point at and between the confluence of Lyon's creek and Chippewa river, and was utilized for the defence of the line of Chippewa creek during September and October, 1814. Stone markers with inscriptions are to be placed on these two sites.

*Port Arthur, Ont.*—It has been decided to erect a cairn and monument in Gore park, Port Arthur, to commemorate the landing of the first military expedition to the Northwest Territories under Col. (Field-Marshal) Wolseley, in 1870, the construction of the Red River road to Fort Garry and other early events associated with its history. The city has dedicated a site for this purpose.

#### WESTERN CANADA

*Northwest Rebellion.*—The board recommended that the sites connected with the Northwest Rebellion of 1882, namely, Batoche, Duck Lake, Fish Creek, Clark's Crossing, Cut Knife Hill and Frog Lake, should be considered as a whole. Steps are being taken to ascertain facts to be submitted for recommendation.

*Fort Prince of Wales, Churchill, Man.*—This fort was built by the Hudson's Bay Company, from 1733 to 1747. It was subsequently destroyed by the French in 1782. The site covers five acres situated at the mouth of the Churchill river. It is Dominion lands and a temporary reservation has been made. There are 38 old guns within the ruined walls, as well as the ruins of the factor's residence. The R.C.M.P. have consented to look after the site.

*Battle of Seven Oaks, Winnipeg, Man.*—The Lord Selkirk Association of Rupert's Land offered to transfer this site, containing approximately one-half acre, on which a monument has been erected to commemorate the above battle, which took place in 1816, between the Fur Trading Companies, where some settlers were killed, provided a monument was erected to the satisfaction of a committee of their members to commemorate the memory of Lord Selkirk and his people.

*Fort Pelly, Sask.*—This is one of the early Hudson's Bay Company's posts, and is situated in township 32, range 32, west P.M. It was thought desirable to restore, preserve, and maintain the buildings on this site, as a typical Hudson's Bay Company's post, on account of the association of these institutions with the early history of Canada. The company offered to sell the site to the department for historical purposes. The department has completed a survey covering an area of 5 acres surrounding the buildings.

A design for an artistic tablet to be used in connection with these sites has been furnished by the well-known Canadian artist, Major Lionel Fosberry, R.C.A., and the tablets are now being cast in bronze. An attractive design for a cairn has also been made by the engineers of the Dominion Parks Branch, and it is hoped, during the coming summer, that several of the above sites will be marked as suggested.



## SESSIONAL PAPER No. 25

## PROTECTION OF MIGRATORY BIRDS

The enforcement of the Migratory Birds Convention Act in Canada and the United States has already resulted in a marked increase in many valuable forms of bird life. This has been especially noticeable among the waterfowl, and reports received show that a notable increase in numbers has occurred in all parts of Canada. In portions of British Columbia during the past fall the shooting was better than at any time for years past; the number of breeding birds on the western prairies, where so many of the waterfowl of the continent are raised, has shown definite increase; and in the Maritime Provinces this spring there was a notable increase in the numbers of ducks and geese going north on migration. This widespread increase is attributed to two of the main features of the treaty, namely, the abolition of spring shooting and the general stopping of the sale of these birds for food purposes.

In June, 1920, an important amendment to the regulations under the Migratory Birds Convention Act was passed. The new features in this amendment were the provision of bag limits upon migratory birds throughout Canada which put into force a recent amendment to the Migratory Birds Convention Act; the provision of shooting restrictions which regulate the manner in which migratory game birds may be legally taken and the equipment that may be used for this purpose; the provision of more complete rules covering persons who wish to capture and keep protected birds for propagating purposes; and the provision requiring all taxidermists preparing protected birds for exhibition purposes to have a Federal license.

The organization for the enforcement of the Migratory Birds Convention Act throughout Canada and for increasing the spread of knowledge concerning this work has been improved by the addition of two chief officers, one for Ontario and Quebec, and one for the western provinces, whose duties will be to co-ordinate all efforts being made in these areas toward the protection of migratory birds. These two officers assumed their new duties late in 1920, and already important results have been obtained through their efforts.

The appointment of some seventy-seven honorary officers throughout Canada has been completed, and about fifty-eight more applications have been received and the appointments are under way. In addition, all fishery officers and overseers in Quebec and the Maritime Provinces have been appointed officers under the Migratory Birds Convention Act, and all officers of the Royal Canadian Mounted Police are game officers under this Act. Persons who are interested in furthering the work of protecting Canadian birds can find a valuable field for their endeavours by undertaking the duties of honorary game officers under the Migratory Birds Convention Act, as it is felt that there is still a large field in which these officers can be of value, and in which they can serve as centres for the dissemination of knowledge concerning bird protection matters and sources of information by which the efforts of this branch may be guided.

## EDUCATIONAL WORK

Due consideration has been given the necessity for acquainting the public of Canada concerning the value of the three great groups of birds which are protected by the treaty. The migratory game birds are protected because they serve as an important food item and because they provide a means of recreation; the non-game birds are protected because of their beauty and aesthetic value; and the insectivorous birds because they serve as one of the most important natural agencies in the control of injurious insect pests. The losses to agricultural and other interests in Canada from insect pests amounted to many millions of dollars last year, and although the work of the birds in controlling these pests was obvious at only a few points, they



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were carrying on this work nevertheless, and must have succeeded in controlling many incipient outbreaks before these assumed epidemic proportions. During the grasshopper outbreak on the prairies many forms of birds were found to be depending upon the grasshoppers for food, and fortunate indeed was the community which possessed a suitable slough in which the Franklin's Gulls could nest, for that community was protected from the grasshopper outbreak by the vigilance of the birds.

Many pamphlets previously issued in the interest of bird protection have been re-printed because the demand for them continued long after the supply had been exhausted. New pamphlets were issued during the year as follows:—

Birds a National Asset (First edition published under title: Ministers of Agriculture Give Views on Bird Protection.)

Bird Houses and their Occupants, by P. A. Taverner.

Les Ministres de l'Agriculture donnent des idées sur la protection des oiseaux.

Maisons d'oiseaux et leurs occupants, par P. A. Taverner.

The posters used to acquaint the public with a summary of the Migratory Birds Convention Act were printed on cardboard for outside use, and through the co-operation of the Post Office Department copies printed on paper were distributed to each of the post offices in Canada.

The permission of each provincial Minister of Education has been obtained allowing the use of three lessons on bird protection in all of the schools of Canada and the material for these lessons has been prepared and they will be printed and distributed shortly.

Members of the staff have given about twenty-five lectures on bird protection subjects during the year. Mr. H. K. Job, Naturalist, of the National Association of Audubon Societies, was brought to Ottawa to speak, the lecture being given under the auspices of the Dominion Parks Branch and of the Canadian Field-Naturalists' Club. While Mr. Job was in Canada on this trip he gave about seven lectures to bird societies and others on bird protection matters, and the favour granted by the Audubon Society, which assisted in the arrangement of this trip, is much appreciated.

A motion picture showing nineteen Trumpeter swans on their wintering ground in British Columbia was taken in the winter of 1919-20, and, as these birds have long been considered on the verge of extinction, this picture has created great interest wherever it has been shown. A copy of it was presented to the National Museum of the United States in October, 1920, and was shown there in Washington, for the first time, at the annual meeting of the American Ornithologists' Union. It was shown as well at a meeting of the American Game Protective Association in New York, and has formed the basis of many talks on bird protection given by our officers at various places in Canada.

The collection of lantern slides in the branch has been increased as rapidly as funds would allow. These have been used by officers of the branch and by outsiders and in addition the latter have occasionally been supplied with the subject matter for bird lectures.

Newspaper articles have been distributed to the press wherever it was desired to give information concerning bird protection matters which were mostly local in character, and the press has co-operated in no small way in spreading valuable information concerning bird protection matters throughout the Dominion.

#### BIRD SANCTUARIES

In June, 1920, seven bird sanctuaries in the province of Alberta were finally established by Order in Council and regulations were drawn up for their control. The final completion of the Saskatchewan sanctuaries is pending and a survey is to be made to locate suitable areas for bird sanctuary purposes in the province of Manitoba during



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the summer of 1921. Advances have been made in providing protection for birds by bird sanctuaries in the province of British Columbia and in that province the land owners in some important areas have almost unaimously signed petitions asking for the creation of bird sanctuaries which cover in part their privately-owned property.

Assistance was given to the Queen Victoria Niagara Falls Park Commissioners of Niagara Falls, Ont., in devising plans for making this attractive beauty spot a bird sanctuary. The efforts of the branch have also resulted in the purchase of an island in lake George by the town of Yarmouth, N.S., for the purpose of creating the island a bird sanctuary and thus protecting a colony of gulls which nest there.

## PUBLIC SHOOTING GROUNDS

In addition to the bird sanctuary areas which are being set aside, it is considered desirable to reserve suitable areas in all available localities so that the public may have reasonable access to the game at all times. This may not be an important question in thinly settled portions at present, but the time may not be far distant when it will be exceedingly difficult for the shooter who is not a member of a game club to obtain any of the migratory game birds or other game birds which are the common property of the people of Canada. Consequently, in co-operation with the Provincial Governments, consideration is being given to the matter of locating and setting aside suitable areas as public shooting grounds.

## PROSECUTIONS

It was necessary for the officers of the branch to take court action in 55 cases. Convictions were registered in 46 cases, in 4 of which the sentence was suspended, and in 9 instances the cases were dismissed. The total fines imposed amounted to \$648 while 7 guns, 1 boat, 36 mounted bird specimens, 2 sleds and 56 pieces of miscellaneous equipment were seized. Of this material 4 guns, 1 boat and 6 mounted specimens were returned to the defendants by the court.

A conviction was registered in the case of *The King vs. Russell C. Clark* by the Supreme Court of Prince Edward Island, thus reversing the decision of the trial magistrate who had dismissed the case in the first instance. The decision of the court has been widely quoted as it shows the views of the courts on some important phases of bird protection.

## INVESTIGATIONS

During the summer of 1920 further investigations were made with respect to the proposed bird sanctuaries in Alberta and Saskatchewan, and in February, 1921, some important work was done in connection with the large flock of Canada geese, which winters in the province of Nova Scotia.

Ninety-seven permits were issued allowing the holders to take birds for scientific purposes; five permits were issued allowing the capture of protected birds for banding purposes, and 116 permits allowing the capture and possession of birds for propagating purposes were issued. As it was found by competent fishery officers that certain birds were causing damage to fish hatcheries in the province of British Columbia, permission was granted allowing the destruction of these birds while actually causing damage to the fish hatcheries.

## WOOD BUFFALO PATROL

The wood buffalo patrol to protect the wild herd of these mammals which ranges in Northern Alberta and the adjoining Northwest Territories has been maintained throughout the year on the usual lines. Mr. F. H. Kitto, of the Natural Resources Intelligence Branch, Department of the Interior, traversed a portion of the wood buffalo area during the summer of 1920, and reported upon the condition of the herd.



NORTHWEST GAME ACT

Licenses, under the Northwest Game Act which has been enforced throughout the year by the Royal Canadian Mounted Police, have been issued as follows:—

Licenses Issued

Hunting and Trapping.—Residents, 103; non-resident British, 21; non-resident non-British, 14.

Trading and Trafficking.—Residents, 159; non-resident British, 3; non-resident non-British, 8.

The revenue received from these licenses amounted to \$3,176.

The furs taken under license as given in returns received here during the year 1920-21 are as follows:—

Moose.. . . . .	19
Caribou.. . . . .	99
Mountain sheep.. . . . .	1
Mountain goat.. . . . .	1
Otter.. . . . .	6
Beaver.. . . . .	339
Martin.. . . . .	897
Fisher.. . . . .	14
Mink.. . . . .	298
Muskrat.. . . . .	7,834
Wolf.. . . . .	10
Wolverine.. . . . .	40
Coyote.. . . . .	1
Lynx.. . . . .	26
Skunk.. . . . .	47
Ermine.. . . . .	1,089
Bear.. . . . .	24
Fox.. . . . .	56
Fox, white.. . . . .	344

The furs reported as traded, as taken from license returns received here during 1920-21, are itemized below and an approximate market value is placed upon the catch:—

	Number	Spring . 1921 Average Market Price.	Approximate Market Value.
Otter.. . . . .	62	\$ 24 25	\$ 1,503 50
Beaver.. . . . .	1,589	15 00	23,835 00
Martin.. . . . .	4,419	37 50	165,712 00
Fisher.. . . . .	27	48 75	1,316 25
Mink.. . . . .	3,236	12 00	38,832 00
Muskrat.. . . . .	74,403	1 60	199,044 80
Wolf.. . . . .	249	7 50	1,867 50
Wolverine.. . . . .	303	6 00	1,818 00
Coyote.. . . . .	3	7 00	21 00
Lynx.. . . . .	113	18 00	2,034 00
Skunk.. . . . .	100	3 60	360 00
Ermine.. . . . .	5,877	0 85	4,995 45
Bear.. . . . .	395	12 00	4,740 00
Fox... . . . .	494	15 50	7,657 00
Fox, white.. . . . .	7,648	37 50	286,800 00
Fox, silver.. . . . .	2	195 00	390 00
Fox, cross.. . . . .	7	35 75	250 25
Fox, blue... . . . .	3	90 00	270 00
			\$661,446 75

The discovery of oil in the vicinity of Fort Norman, Northwest Territories, may lead to a further drain upon the game resources of the territories and special protective measures have been taken to insure respect for the law.



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The wolf bounty paid during the year amounted to \$3,940, representing \$20 each for 197 wolves.

There have been three convictions for violation of this Act during the year. A fine of \$5 was imposed in one instance and three seizures have been made under the Act. In one instance two musk-ox skins found in the possession of a trader were seized and ordered returned to the Coronation Gulf Eskimos who had taken them.

## MUSK-OX AND REINDEER

The report of the Royal Commission appointed to consider the advisability and feasibility of developing reindeer herds in Northern Canada and the domestication of the musk-ox has been placed before the Government and contains very valuable information on this question which will be of great service in the event of action being taken.

The only herd of domesticated reindeer in the Dominion, which had been under the control of the Department of Indian Affairs, was taken over by the Department of the Interior and the administration given to this branch during the summer of 1920. This herd, which is located at Old Fort, Quebec, numbering 142, was placed in charge of a competent officer and according to the latest report has increased to about 180.

The experience which is being gained in the handling of this herd should prove of great assistance in deciding upon a future policy with respect to the development of reindeer in Northern Canada as a source of increased food supply both for the natives and for Canada generally.

## APPENDIX No. 1

REPORT OF THE SUPERINTENDENT OF ROCKY MOUNTAINS PARK,  
R. S. STRONACH, BANFF, ALBERTA

The past fiscal year has been one of the most successful since the creation of this park. All records have been broken for number of bathers at the Government bath-houses, number of tourists visiting the park, motor traffic and revenue. A new record for the number of persons registered at the various hotels in Banff has been made and the public camping grounds were also well patronized, approximately 900 persons camping on these grounds during the season. The revenue for the past fiscal year collected by this office amounted to \$58,314.34, which is an increase of \$11,358.65 over the year 1919-20 which previously held the record for revenue taken in by this office. Although the number of building permits issued was not so large as for the year 1919-20, they called for construction to the estimated value of \$66,883, which is \$34,633 greater than for 1919-20.

## ROADS

During the past year special attention was paid to the improvement and maintenance of roads, this work being necessary owing to the large increase in motor traffic. Although this is already large, when the highway from Banff to Windermere is completed, it will no doubt be much increased.

Very little rain fell during the past summer, consequently the surface of the roads dried out and maintenance charges were proportionately increased not only through lack of moisture, but owing to the fact that a very heavy motor traffic passed over all our roads.



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Approximately 5½ miles of road were coated with asphaltic oil, 18,488 gallons being used for this purpose. Seven miles of streets in Banff were also oiled. Most satisfactory results were obtained from this treatment of the road surfaces, and it is hoped that the mileage oiled will be greatly increased during the present year.

During the year the Alberta Provincial Government did a considerable amount of work on the road between Calgary and the eastern boundary of the park. This work, in conjunction with the work done in the park by the Parks Branch, now gives a first-class highway between Calgary and Banff.

Great difficulty was experienced during July, August and part of September, in securing sufficient labour to carry on the various works authorized due to the scarcity of labour through the demand for harvesters at that season, but fortunately we had a late and open fall which allowed us to catch up with the work.

#### ANIMAL ENCLOSURES

The exhibit of buffalo, which is always a great attraction to the many visitors to the animal enclosures, has been increased by the addition of five buffalo cows from the large herds at Wainwright. A young buffalo bull was also received from Wainwright during the year. Six Rocky Mountain goats captured during the early fall have been placed in the enclosures.

The following is a list of the animals now in the enclosures: 12 Angora goats, 6 buffalo bulls, 5 buffalo cows, 1 buffalo calf (male), 34 elk, 62 four-horned sheep, 1 moose (female) balance having been released during the fall, 1 Persian sheep (female), 5 Rocky Mountain goats, 17 Rocky Mountain sheep, 1 Siberian pony, 21 yak.

During the past year animals were shipped to the following points:—

Zoological Gardens, Washington, D.C.—2 Rocky Mountain sheep, 5 Rocky Mountain goats.

Zoological Gardens, New York.—4 Rocky Mountain sheep, 2 Rocky Mountain goats.

Stanley Park, Vancouver, B.C.—2 Rocky Mountain sheep, 2 Rocky Mountain goats, 2 Angora goats.

United States Government, Sitka, Alaska.—2 yak.

#### GOVERNMENT ZOO

Considerable maintenance work was done in connection with the fences, buildings and concrete floors of the animal cages in the Zoo. A heating plant was installed in the bird houses. By this means the pens in which the various specimens of birds are housed during the winter months are kept at an even temperature, a factor which helps greatly in keeping the birds in a healthy condition.

The following is the list of animals at present in the Zoo:—2 badgers, 2 bald eagles, 3 black bears, 2 bobcats, 4 Canada geese, 1 cinnamon bear, 2 cougars, 2 coyotes, 1 golden eagle, 3 gophers, 2 grizzly bears, 2 ground owls, 3 horned owls, 3 Lady Amherst pheasants, 1 mink, 1 Mongolian pheasant, 2 pea fowl, 4 pine martens, 1 Polar bear, 2 porcupines, 4 red foxes, 1 red tailed hawk, 8 Rhesus monkeys, 3 ring-necked pheasants, 2 silver pheasants, 1 timber wolf, 1 white ground hog, 2 wolverines.

#### GOVERNMENT BATHS

It is very gratifying to note that the two government bathing establishments again proved their popularity, new records in the number of bathers both at the Upper Hot springs and at the Cave and Basin being established. During the months of July and August accommodation at the Cave and Basin was taxed to the limit.



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All the rooms in the new portion of the building were constantly occupied and the dressing rooms around the old disused pool were repaired and utilized to great advantage during rush periods. By this arrangement the congestion was somewhat relieved. The bathhouse at the Upper Hot springs also had a very successful season.

The numbers of bathers at the two bathhouses were as follows:—

## CAVE AND BASIN.

	1920-21	1919-20	Receipts.	
			1920-21	1919-20
Number of bathers.. . . .	44,691	38,917	10,578 20	9,037 75

## UPPER HOT SPRINGS.

	1920-21	1919-20	Receipts.	
			1920-21	1919-20
Number of bathers.. . . .	27,866	24,221	6,886 35	5,854 85

This shows an increase of 9,419 bathers over the record which was established during the previous year.

The cave at the Cave and Basin was also well patronized, the number of visitors registering being 23,425.

## CAMPING GROUNDS

The public camping ground near the Spray river was extremely popular during the season. Two hundred camping permits were issued, an increase of 123 over the previous year. The increasing popularity of the campsite is shown by the number of permits issued during the four years it has been in operation:—

1917-18.. . . .	73
1918-19.. . . .	57
1919-20.. . . .	77
1920-21.. . . .	233

## FISHING

Fishing in all the waters of the park during the past season was exceptionally good. During the first part of July the rivers were still muddy from spring freshets, which interfered with the fishing, but the Kananaskis, Twin, Consolation and Harrison lakes all afforded good sport. Some good catches of Lake Minnewanka trout running to 16 pounds were made. During August fishing was reported excellent in all park waters. About 6,000 pounds were taken in this month, including 300 pounds from lake Minnewanka.

The Dominion Fish Hatchery in Banff continued work throughout the year with excellent results. The following game fish were liberated in the waters of Rocky Mountains park:—

Salmon trout.. . . .	150,000
Rainbow trout.. . . .	22,660
Cutthroat trout (in Spray lakes).. . . .	153,992
Cutthroat trout (other park waters).. . . .	278,760
Total.. . . .	605,412

A shipment of salmon trout was also made to Jasper park and 24,312 fry were liberated.

## FIRE BRIGADE

During the year twenty-six fire alarms were received by the fire brigade, the majority being for chimney fires. Two cubicles have been constructed in the fire hall, thus providing sleeping quarters for two additional firemen. This brings the number of members of the fire brigade sleeping at the fire hall to five.

During the year a Gamewell fire-alarm system was installed in Banff, and fire-alarm boxes were placed in the outlying portions of the town. This system, which is tested every week, will undoubtedly be of great value when sending in fire calls.



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## FOREST FIRES

Owing to the extreme dryness of the weather during the summer and the frequent high winds considerable anxiety was felt with regard to forest fires. Thanks to the vigilance of the warden staff and the improved equipment with which we are now furnished we were able to extinguish every outbreak of fire without much difficulty. Two fires, however, entered the park from the British Columbia side of the divide, one at the head of Bryant creek, and the other at the head of Douglas creek. Another fire occurred at the Kananaskis lakes, the latter burning over about 2,000 acres of mixed growth. The Royal Canadian Mounted Police gave valuable assistance in fighting these more serious fires. The total expenditure for fire fighting for the year was \$4,578.82.

A Government aviation station was established during the year on the eastern boundary of the park, and although the aerial patrol work was confined for the most part to the forest reserves in the foothills, some patrols were made in the vicinity of Banff during which excellent photographs of the Bow valley were taken.

## FIRE-FIGHTING EQUIPMENT

In addition to the five gasoline fire-fighting units and the Ford truck already in use, a Reo fire-fighting truck complete with pump and 3,000 feet of 2½-inch hose has been added. This new equipment is likely to prove a very valuable addition in fighting fires which may occur in the vicinity of our highways.

## GAME PROTECTION

It is gratifying to note that the game regulations are being generally observed. During the year there was only one violation of the regulations, and in this case a conviction was secured and a heavy fine imposed.

During the month of July a large number of moose were seen in the Spray lakes district, these animals apparently having come into the park from British Columbia.

The herd of elk brought in from the Yellowstone National park in 1918 has done exceedingly well, and is increasing in numbers. It is estimated that the number of elk now ranging in this park is 325 head.

## GOVERNMENT BUILDINGS

A new steam-heated garage for Government cars was completed during the early summer and has proved very satisfactory. The old official residence for the park superintendent at Banff was demolished, and a new residence, largely constructed from material used in the former, was built on the old site.

## GOLF LINKS

Work on the new Banff golf links has been carried on throughout the year. Courses 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14 and 15 have all been completed as far as clearing, grubbing, and bunkers are concerned. Satisfactory progress was made in the spreading of soil on these courses and it is expected that the seeding of the new portion of the links will be completed this spring, also that some of the holes seeded last year will be available for play. The revenue derived last year was \$3,643, which is \$702 more than the previous best.



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## HEALTH

Health conditions as usual in the park during the past year have been exceptionally good. There were no epidemics and very few cases of infectious or contagious diseases.

During the latter part of the fiscal year a tubercular test of all dairy cows in the park was undertaken by an officer of the Department of Agriculture, assisted by our inspector. At its completion the veterinary surgeon stated that the cattle in Rocky Mountains park were the healthiest he had ever tested.

## LICENSES

The following licenses were issued during the fiscal year 1920-21: 18 auto transfer licenses, 133 auto livery licenses, 227 private auto licenses, 2,746 transient licenses, 125 park season licenses, 175 chauffeur's licenses, 7 motor cycle licenses, 3 motor launch licenses, 26 horse livery licenses, 5 boatman's licenses, 109 dog licenses, 10 driver's licenses, 27 guide's licenses, 3 gum machine licenses, 2 moving picture operator's licenses, 70 peddler's licenses, 5 poolroom licenses, 58 rowboat licenses, 1 steamboat license, 30 tearoom licenses, 1 tent circus license, 1 bowling alley license, 9 butcher's licenses, 2 moving picture theatre licenses.

In practically every case the number of licenses taken out last year shows an increase over those taken out in previous years.

## MOTOR TRAFFIC

Motor traffic in this park showed a large increase. The total number of automobiles passing through the entrance gate at the eastern boundary of the park during the year was 2,774, an increase of 796 over the previous year.

## MOSQUITO MENACE

During the past spring and early summer all Western Canada suffered from an unprecedented number of mosquitoes. In order to prevent the breeding of these pests a large quantity of oil was spread on the swamps and other breeding places, also a considerable amount of brushing and drainage was done, a work which greatly reduced the number of eggs hatched out in those places. It is intended to renew these efforts during the coming season and to extend the oiling and other work done last year.

## MUSEUM

The following specimens have been added to the museum during the year:—

*Birds.*—American golden eye duck, sharp shinned hawk, belted kingfisher, Louisiana tanager (brilliantly plumaged male), Bohemian waxwing (male), Western pine grosbeak (brilliantly coloured male).

The following skin study specimens were received: American golden eye duck, sharp shinned hawk, junco.

All these birds were killed within the park by flying against windows or telephone wires.

## MAMMALS

Rocky Mountain sheep (ram), Rocky Mountain sheep (ram), timber wolf (full size), mink (mounted), 3 young mule deer (preserved in formalin).



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## BIRDS

In October seventeen Trumpeter swans landed on the third Vermilion lake, and remained there for several days. This is the first recorded appearance of these birds in the vicinity of Banff. Several Wavey geese accompanied these swans. Hungarian partridge were seen during the fall near Johnston canyon. This is their first appearance in the vicinity of Banff.

## BUILDING PERMITS

During the year fifty-four building permits were issued. The estimated cost of the work covered amounted to \$66,883.

## GRAZING PERMITS

The number of grazing permits issued during the year was eighty-seven, an increase of six over the previous year. The above permits covered the grazing of 315 horses and 206 cows.

## TIMBER PERMITS

Ninety-four permits were issued to residents for the cutting of dry wood in the vicinity of Banff, covering approximately 314 cords of firewood. Thirty-three permits for quarter-sections were also issued, and 2,630 cords of timber cut on the areas covered.

Logging operations were continued by the Eau Claire and Bow River Lumber Company on their limits in the Spray valley, and 4,500,000 feet of timber cut during the year.

## POLICE

The Royal Canadian Mounted Police were in charge of the enforcement of law and order throughout the park. Conditions in this respect have been very good. In spite of the large floating population, while there were a number of minor offenses, there were few crimes and none of a serious character.

## ROADS AND BRIDGES

The improvement and maintenance of all roads within the park was a matter of special attention during the year. Large gangs of men were employed on the Banff-Kananaskis and on the Banff-Castle roads. Portions of these roads, over which there is considerable motor traffic, were treated with a coat of asphaltic oil from which very satisfactory results have been obtained. A diversion of the Loop drive around the golf links necessitated by the construction of the new course was commenced during the year and is now practically completed. Construction on the Castle-Lake Louise road is almost completed, only the surfacing remains to be done. It is expected that this road will be opened for motor traffic during the coming summer. It will undoubtedly become one of the most popular roads in the park.

Good progress has been made with the new bridge over the Bow river, the construction of which was begun last September by the Department of Public Works, and which has been carried on throughout the winter. Work was also commenced during the latter part of the winter on a new two-span 200 foot wooden truss bridge over the Cascade river near Anthracite. This bridge is being erected to replace the bridge which was moved in 1916 to replace a span washed out from the bridge situated on the Banff-Calgary motor road  $3\frac{1}{2}$  miles east of Banff.



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## TELEPHONES

During the past season the Banff telephone system has been completely remodelled along the lines that have been under consideration for a number of years. The system is now thoroughly up to date in every respect. A cable system along the lanes has replaced the open wire system along the streets and follows a well defined plan that will allow for unlimited development. It is intended in the near future to remove all poles and wires from Banff avenue which will add greatly to its appearance.

## GOVERNMENT TOWNSITES

*Banff.*—General maintenance work on the streets of Banff was carried on during the past season. All the town streets as well as Banff avenue, Cave and Basin road, Spray avenue and Golf Links road, were treated with a coat of asphaltic oil.

The demand for building lots in the residential districts of Banff has been very heavy during the year. It is hoped that the St. Julien subdivision will be thrown open to the general public during the coming year. Several applications have already been received for lots in this district.

*Canmore.*—In January last the public school was burned to the ground and the school trustees have applied for a new site for the purpose of erecting a new school. The estimated cost of this structure will be in the neighbourhood of \$35,000. It is a matter for great thankfulness that, although the school was in session at the time the fire occurred, no lives were lost.

*Lake Louise.*—In anticipation of the opening of the Banff-Lake Louise road to motor traffic, several applications have been received at this office for building sites at Lake Louise.

*Lake Minnewanka.*—Owing to the close proximity of the lake to Banff no great demand has yet been made for building lots but it is expected that with the increase in motor traffic this townsite will develop in the near future.

## TRAILS

The following new trails were constructed during the past year:—Trail from Fortymile creek to Mystic lakes, distance 3 miles; trail from the mouth of Molar creek, in Pipestone valley, over the summit of Molar pass to Mosquito creek, length 12 miles. Both the above trails pass through beautiful alpine country.

The trail from the Gap to Boundary cabin in the lower Kananaskis valley which had previously been constructed for only a portion of the distance was finished, length completed, 12 miles.

## VISITORS

In August last the members of the Imperial Press Delegation visited Banff. Included in this party were well known journalists from England, Scotland, Wales, Ireland, Australia, India, South Africa, Natal, Egypt, New Zealand, Ceylon, Singapore, Jamaica, Malta, Newfoundland and Canada.



APPENDIX No. 1a

VISITORS TO ROCKY MOUNTAINS PARK FROM APRIL 1, 1920 TO MARCH 31, 1921

BANFF SPRINGS HOTEL, BANFF, ALTA.

Season 1920.

Canada.. . . . .	3,356
United States.. . . . .	9,952
British Isles.. . . . .	468
Other countries.. . . . .	561
Conducted parties.. . . . .	101
Total .....	14,438
Total 1919.. . . . .	11,177
Increase.. . . . .	3,261

CHATEAU LAKE LOUISE, LAKE LOUISE, ALTA.

Canada.. . . . .	1,825
United States.. . . . .	13,508
British Isles.. . . . .	449
Other countries.. . . . .	543
Conducted parties.. . . . .	412
Total .....	16,737
Total 1919.. . . . .	12,960
Increase.. . . . .	3,777

HOT SPRINGS HOTEL, BANFF, (Open all year).

Canada.. . . . .	375
United States.. . . . .	6
British Isles.. . . . .	1
Other countries.. . . . .	2
Total.. . . . .	384
Total 1919.. . . . .	550
Decrease.. . . . .	166

HOMESTEAD HOTEL, BANFF, (Open May 15 to September 28).

Canada.. . . . .	2,147
United States.. . . . .	413
British Isles.. . . . .	20
Other countries.. . . . .	20
Total.. . . . .	2,600
Total 1919.. . . . .	2,361
Increase.. . . . .	239

KING EDWARD HOTEL, BANFF, (Open all year).

Canada.. . . . .	5,501
United States.. . . . .	1,885
British Isles.. . . . .	128
Other countries.. . . . .	168
Total.. . . . .	7,682
Total 1919.. . . . .	7,750
Decrease.. . . . .	68



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## MOUNT ROYAL HOTEL, BANFF, (Open from May 15).

Canada.. . . . .	3,559
United States.. . . . .	2,578
Europe.. . . . .	385
Total.. . . . .	6,522
Total 1919.. . . . .	6,250
Increase.. . . . .	272

## ALBERTA HOTEL, (Open two months).

Canada.. . . . .	1,783
United States.. . . . .	200
Other countries.. . . . .	36
Total.. . . . .	2,019
Total 1919.. . . . .	3,500
Decrease.. . . . .	1,481

## SUMMARY.

Banff Springs hotel.. . . . .	14,438
Chateau Lake Louise.. . . . .	16,737
King Edward hotel.. . . . .	7,682
Mount Royal hotel.. . . . .	6,522
Sanitarium hotel.. . . . .	4,500
Alberta hotel.. . . . .	2,019
Homestead hotel.. . . . .	2,600
Hot Springs hotel.. . . . .	384
Summer cottagers and campers.. . . . .	7,000
Motorists.. . . . .	11,000
Excursionists.. . . . .	6,000
Total 1920-21.. . . . .	78,882
Total 1919-20.. . . . .	69,830
Increase.. . . . .	9,052

## APPENDIX No. 1b

METEOROLOGICAL REPORT FOR THE MONTHS OF JUNE, JULY, AUGUST AND  
SEPTEMBER, 1920, BANFF, ALBERTA

Date		Max.	Min.	Remarks
June	1.....	53.2	32.0	Fair.
"	2.....	55.5	30.0	Cloudy; few drops of rain.
"	3.....	65.2	28.2	Fair.
"	4.....	63.2	30.5	Cloudy.
"	5.....	67.0	40.2	Fair; rain; very fine day.
"	6.....	60.3	36.7	Fair; rain.
"	7.....	59.9	41.2	Cloudy; light rain.
"	8.....	59.2	39.0	Cloudy; rain; strong S.W. wind.
"	9.....	59.0	36.2	Cloudy.
"	10.....	63.2	29.3	Fair; very fine day.
"	11.....	61.0	35.8	Cloudy; rain; fresh snow on mountains.
"	12.....	56.8	34.3	Fair; rain; very fine day.
"	13.....	65.3	28.5	Fair; very fine day.
"	14.....	68.5	40.3	Fair; very fine day.
"	15.....	71.0	42.0	Fair; very fine day.
"	16.....	62.0	43.7	Cloudy; trace of rain.
"	17.....	69.0	40.2	Fair; very fine day.
"	18.....	69.5	36.3	Fair.
"	19.....	60.9	31.3	Fair; rain.
"	20.....	65.1	38.0	Fair; very fine day.



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METEOROLOGICAL REPORT FOR THE MONTHS OF JUNE, JULY, AUGUST AND  
SEPTEMBER, 1920, BANFF, ALBERTA—*Continued*

Date		Max.	Min.	Remarks
June	21	75.2	31.0	Fair; very fine day.
"	22	65.0	37.0	Cloudy; rain.
"	23	48.7	36.0	Cloudy; heavy rain; snow low down on mountains.
"	24	53.1	29.9	Cloudy; rain.
"	25	60.2	31.9	Cloudy; soft hail.
"	26	60.2	30.8	Cloudy.
"	27	60.2	42.4	Cloudy.
"	28	74.2	37.3	Fair; very fine day.
"	29	77.2	34.6	Fair; perfect day.
"	30	81.2	41.7	Fair; perfect day; rivers high.
July	1	79.2	51.8	Fair; perfect day.
"	2	80.8	42.4	Fair; very fine day.
"	3	79.9	49.4	Fair; perfect day.
"	4	78.1	38.2	Fair; rain; very fine day.
"	5	50.3	39.4	Overcast; heavy rain.
"	6	65.2	44.0	Cloudy; rain.
"	7	73.2	37.5	Fair.
"	8	77.2	39.9	Fair; very fine day; thunderstorm.
"	9	79.8	46.0	Fair; very fine day, light rain.
"	10	78.0	44.9	Fair; rain.
"	11	76.0	45.9	Thunderstorm.
"	12	59.1	48.6	Cloudy; rain.
"	13	67.2	43.2	Fair.
"	14	81.0	40.7	Fair; very fine day.
"	15	84.0	43.9	Fair; perfect day.
"	16	87.2	44.8	Fair; perfect day.
"	17	87.2	47.7	Fair.
"	18	85.3	48.8	Fair; very fine day.
"	19	87.8	49.7	Fair; thunder.
"	20	84.0	48.9	Fair; light rain; thunderstorms.
"	21	82.3	47.4	Fair; rain; thunderstorms.
"	22	64.8	49.7	Cloudy; trace of rain, thunderstorm.
"	23	78.2	41.0	Fair; very fine day.
"	24	76.1	40.2	Fair.
"	25	73.9	43.7	Fair.
"	26	78.9	39.2	Fair; very fine day.
"	27	83.2	42.4	Fair; very fine day.
"	28	87.9	38.3	Fair; very fine day.
"	29	83.7	49.8	Fair; thunderstorm.
"	30	85.3	55.7	Thunder.
"	31	83.1	46.1	Fair; perfect day.
Aug.	1	78.2	41.8	Fair; very fine day; some smoke.
"	2	85.2	44.1	Fair; thunderstorm; very fine day.
"	3	77.1	43.7	Fair; very fine day.
"	4	78.7	45.2	Fair; perfect day.
"	5	85.9	37.7	Fair; perfect day.
"	6	88.3	39.3	Fair; perfect day.
"	7	89.3	40.8	Fair; perfect day.
"	8	86.9	42.2	Fair; perfect day.
"	9	73.0	56.2	Cloudy.
"	10	72.2	44.5	Fair; rain; thunderstorms.
"	11	78.0	47.5	Fair.
"	12	84.5	41.8	Fair; very fine day.
"	13	86.2	48.0	Fair.
"	14	80.2	46.8	Fair.
"	15	82.2	48.8	Fair.
"	16	85.9	43.8	Fair.
"	17	62.2	45.2	Cloudy; light rain; very smoky.
"	18	59.7	41.2	Cloudy.
"	19	70.2	36.5	Cloudy.
"	20	75.7	35.3	Fair; perfect day.
"	21	81.8	39.8	Fair; very fine day.
"	22	84.0	39.3	Fair; perfect day.
"	23	75.1	42.8	Fair; very fine day, thunderstorms.
"	24	75.9	38.5	Fair; very fine day.
"	25	60.5	44.2	Cloudy; rain.
"	26	55.8	45.0	Cloudy; rain.
"	27	58.0	39.9	Cloudy.



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METEOROLOGICAL REPORT FOR THE MONTHS OF JUNE, JULY, AUGUST AND  
SEPTEMBER, 1920, BANFF, ALBERTA—*Concluded.*

Date		Max.	Min.	Remarks
Aug.	28.....	55.2	44.0	Cloudy; light rain.
"	29.....	60.8	28.2	Cloudy.
"	30.....	59.1	41.0	Cloudy.
"	31.....	69.3	30.2	Fair; perfect day.
Sept.	1.....	74.0	30.2	Fair; very fine day.
"	2.....	74.9	33.0	Perfect day.
"	3.....	78.4	34.8	Fair; perfect day; aurora.
"	4.....	77.1	35.2	Fair; very fine day.
"	5.....	76.0	36.9	Fair; thunderstorm; heavy rain.
"	6.....	55.8	41.5	Fair; heavy rain.
"	7.....	66.2	29.2	Fair; very fine day.
"	8.....	70.0	29.7	Fair; perfect day.
"	9.....	62.8	30.9	Cloudy; light rain.
"	10.....	50.9	41.0	Cloudy; rain.
"	11.....	52.3	35.0	Cloudy; trace of rain.
"	12.....	51.2	41.0	Cloudy; rain.
"	13.....	51.5	33.8	Cloudy; rain.
"	14.....	53.1	33.0	Cloudy; rain.
"	15.....	51.2	39.5	Cloudy.
"	16.....	62.2	48.0	Cloudy.
"	17.....	72.2	34.8	Fair; perfect day.
"	18.....	56.2	42.4	Fair; heavy rain; aurora.
"	19.....	62.4	27.2	Fair; perfect day.
"	20.....	55.2	44.7	Cloudy; rain.
"	21.....	52.3	40.2	Cloudy; light rain.
"	22.....	54.5	33.8	Cloudy; rain.
"	23.....	50.8	32.2	Fair; rain.
"	24.....	55.0	36.3	Cloudy.
"	25.....	47.0	36.3	Cloudy.
"	26.....	47.2	36.5	Cloudy.
"	27.....	51.0	37.5	Cloudy; light rain.
"	28.....	61.2	27.0	Fair; perfect day.
"	29.....	71.0	28.8	Fair; perfect day.
"	30.....	70.0	31.5	Fair; perfect day.

## APPENDIX No. 1c

## THE ALPINE CLUB OF CANADA

*(Report prepared by the Secretary)*

The Alpine Club House was open to members and their friends during the entire season. The attendance was the largest yet recorded and, as will be seen, was drawn from an unusually wide area. The tourist industry of this continent does not appreciate how large is the public which would travel if accommodation simpler than that of the huge and expensive railway caravansaries was provided. The prosperity of the enormous tourist business of Switzerland is founded on the appeal to the many, not to the comparatively few rich people. That nation has proved the possibility of hotels, simple in accommodation, reasonable in price, and of the utmost comfort.

The face of Cascade, the traverse of Mount Norquay, several ascents of mount Edith were made during the season and the other excursions of the beautiful Banff region were enjoyed.

Owing to the abnormally late opening of the season and the heavy forest fires less original climbing than usual was done. Mr. A. L. Mumm from England and Mr. V.



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A. Fynn climbed mount Freshfield. Dr. Hickson of Montreal made mount Forbes, a most interesting climb. Sir Donald was climbed by Mr. Osler of the English Alpine Club and the chief mountains in the Lake Louise region were climbed by members. The activities in the neighbourhood of mount Assiniboine are described in the camp section.

As usual many strangers made inquiries concerning mountain matters and the opening of a well informed and appreciative bureau of mountain information becomes more and more imperative.

Visitors to the club house were drawn from the following:—British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, London, California, District of Columbia, Illinois, Indiana, Iowa, Massachusetts, Maryland, Michigan, Minnesota, New Jersey, New York, North Dakota, Oregon, Pennsylvania, Wisconsin, India and Switzerland.

## APPENDIX No. 2

### REPORT OF THE SUPERINTENDENT OF YOHO AND GLACIER PARKS, E. N. RUSSELL, FIELD, B.C.

At the beginning of the year I was relieved by the department of the supervision of Mount Revelstoke park, Mr. F. E. Maunder, who had returned from overseas, again taking over his duties as superintendent. In severing my connection with this park I can only express my appreciation and thanks to the citizens of Revelstoke for the courtesy, assistance and co-operation which at all times was so freely given during the four years the park was under my charge, and which helped to make every duty a pleasure.

One of the most important steps in the history of the Dominion parks in the province of British Columbia was brought about as a result of the agreement concluded during the previous year between the Federal Government and the province of British Columbia. Under the terms of this agreement the control of all game and the collection of licenses within Dominion parks, which had hitherto been in the hands of the province, were transferred to the Dominion. It was also arranged that the Royal Canadian Mounted Police should take over the enforcement of law and order within the parks, including the laws for which the province is usually responsible. The result of this agreement has been to create the parks in British Columbia inviolate wild life sanctuaries similar to those in Alberta, the Dominion parks regulations with regard to game automatically coming into effect.

The enforcement of the parks regulations was rigidly carried out by the warden staff during the year. Two cases of confiscation for carrying unsealed firearms occurred and in one case a fine was inflicted but I am pleased to say that on the whole the public showed every disposition to assist us and very little trouble was experienced.

The results of the increased protection became apparent almost immediately, particularly with respect to bear, moose and deer. These animals roamed the park at will and seemed to know that no harm would befall them. They were frequently seen on the main roads of the park and even came into the town of Field. A colony of beavers was found working on the Kickinghorse flats at Ottertail and another in the Ice River valley, while goat, grouse and ptarmigan were also quite numerous.

#### RE-ADJUSTMENT OF BOUNDARIES

Another step of importance to wild life protection was the adjustment of the boundaries of Yoho park. During the year an arrangement was made by which the branch relinquished all that portion of the park lying to the west of the Beaverfoot



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river and south of the north boundary of township 25, range 19, west of the 5th meridian in exchange for a new area on its northern boundary.

## ROADS AND TRAILS

The first work of the year was the customary clean-up around the townsite of Field, which was commenced in April as soon as conditions would allow. Mount Stephen avenue, which was opened up last fall, was completed by being surfaced with gravel hauled from the bed of the Kickinghorse river. All streets were cleaned up and repaired as usual and the sidewalks put into good condition.

In May the Yoho, Emerald Lake and Ottertail roads were gone over and the necessary repairs undertaken. On the Yoho road an unusually heavy snowslide had done considerable damage, completely covering the road for an average depth of twelve feet for a distance of over half a mile and carrying away two bridges in its course down the valley. As soon as the general road repairs were completed, sectionmen were placed on the Yoho and Emerald Lake roads for maintenance purposes with the usual good results.

Minor repairs were made during the spring to the bridge over the Kickinghorse river at Field and in the autumn the construction of a new bridge was begun. At date of writing the new bridge is almost complete. It is a good improvement over the old structure which was built some twenty years ago, and which was inadequate for the present traffic. The new structure consists of three spans 100 feet long, each span supported on two centre piers. The width between wheel guards is 17 feet 9 inches, and the load capacity of the bridge 18 tons.

## FOREST PROTECTION

An addition was made to our telephone system by the stringing of a line from Field to the Chalet cabin, on the Emerald Lake road, a distance of 6 miles. Telephones were installed in the Snowpeak and Chalet cabins, which during the fire season are usually occupied by sectionmen. This and the other lines were connected up with the chief warden's cabin, thus placing the chief warden in direct communication with his warden staff and also with outlying portions of the park. The total telephone mileage in the park is now 24 miles.

Although the season was very dry I am pleased to say that owing to the vigilance of the wardens only one forest fire occurred which assumed serious proportions. This occurred on the Ottertail trail near Frenchman's creek where the timber and undergrowth are very dense. About 500 acres were burned over.

Now that the branch has taken over full control of game in the park, the wardens' positions have been made permanent instead of seasonal as heretofore. This adds greatly to the efficiency of the staff as it is possible to secure a better class of applicant and also to build up an experienced staff. The four wardens in Yoho park working under the supervising warden during the past two years have accomplished a very large amount of work. In addition to the regular patrol of our 158 miles of trails they have handled all minor repairs to trails and telephone lines and have constructed three new cabins, one of which is a five-roomed house, and two stables. At the time of writing another log stable and barn capable of accommodating twelve horses and with suitable harness, feed and storage rooms is almost completed. These buildings are well constructed of peeled logs and present a very pleasing appearance.

## TOURIST TRAVEL

Tourist travel was fairly large again this year and would have been larger had the facilities of the park been able to accommodate more people. The Emerald Lake Chalet and the Yoho Camp were both filled to overflowing, while all other accommo-



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dation available in the town was in constant demand. The Canadian Pacific Railway Chalet at Emerald lake added considerably to its capacity by the erection of a number of tents dotted around in close proximity to the Chalet which for the first time ran a motor bus between the hotel and the station to meet all trains.

Motors were allowed this year for the first time on the Yoho road, the last of our roads to be thrown open to this class of traffic. Many of the residents availed themselves of this privilege and brought in cars which mixed freely with the horse traffic, and I am pleased to say that not a single case of accident of any kind was reported. This can be attributed to the care exercised by the drivers and to a rigid enforcement of the speed and other motor regulations.

#### GLACIER PARK

The first work undertaken in Glacier park was the widening and surfacing of the road between Glacier station and the hotel. About  $1\frac{1}{2}$  miles of this road were too narrow to permit of two teams passing; this portion was therefore re-graded, and then ballasted with ballast taken from a portion of the old abandoned railroad grade. This road has to carry a heavy traffic during the summer months, all of it on narrow-tired rigs, but for a dirt road it has stood the test as well as could be expected. The road to the Nakimu caves and the completed portion of the Rogers Pass road were then gone over and it was intended to complete the road between Glacier and Rogers Pass but owing to the extreme scarcity of labour this work had to be postponed.

#### TRAILS

As soon as the snow was sufficiently melted a trail gang began the construction of a new trail up Grizzly creek, commencing at the intersection of Grizzly creek with the Beaver Valley trail and running to the headwaters of the Spillimacheen river, a distance of 8 miles. A good trail already exists running down the North fork of this river to the Columbia valley, so that it is now possible to go by trail from Glacier to Banff, which before the construction of this trail was not feasible.

The other trails in the park were cleared out and bridges repaired or replaced as required.

#### TELEPHONES

A new line was constructed between Bear Creek cabin and Stoney Creek station, a distance of about  $1\frac{1}{2}$  miles. This line connects the warden stationed at Bear Creek with the Canadian Pacific Railway telegraph station and hence with the superintendent's office at Field and other points and will be a great help in facilitating the speedy sending of assistance in cases where help is required to fight fires.

#### GAME

In this park as in Yoho park, the game is now under the jurisdiction of the Dominion Parks Branch, and protection is rigidly enforced through the warden staff. All rifles and guns within the park have been sealed, and wild life is protected in every way possible. The results of this protection even for so short a time are easily seen and game of all kinds is becoming more plentiful.

#### FOREST PROTECTION

Three forest fires occurred in the park which caused some anxiety, all of them caused by electrical storms. Two of these started in the Beaver valley and one near Flat creek. On account of the scarcity of men I was forced to use our road and trail gangs to assist the wardens in fighting them which delayed some of our other work.



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Generally speaking the year just passed has been one of progress for both the Yoho and Glacier parks. Most of the work contemplated has been carried out and the revenues in both parks show an increase of almost double that collected in any previous year.

## NUMBER OF VISITORS AT EMERALD LAKE CHALET, YOHO PARK, SEASON, 1920.

Canada.. . . .	212
United States.. . . .	932
British Isles.. . . .	60
Other countries.. . . .	37
Total.. . . .	1,241

## GLACIER HOUSE, GLACIER PARK.

Canada.. . . .	260
United States.. . . .	3,133
British Isles.. . . .	131
Other countries.. . . .	119
Conducted parties.. . . .	136
Total 1920.. . . .	3,779
Total 1919.. . . .	2,233
Increase.. . . .	1,546

## APPENDIX No. 2a

## REPORT OF THE FIFTEENTH ANNUAL CAMP OF THE ALPINE CLUB OF CANADA AT MOUNT ASSINIBOINE

The Fifteenth Annual Camp of the Alpine Club of Canada was held at the foot of mount Assiniboine from July 27 to August 8. The original plan had been to hold it a week earlier, but the unprecedented late lying of the snows rendered it impossible. When finally summer did start the weather was perfect, but the end of the camp was troubled by the smoke of forest fires which later developed to serious proportions.

The holding of the camp was made possible by the institution of the Walking Tour scheme, the members making use of the comfortable camps on their way to and from Banff. From Golden Valley Camp the first ascent of a neighbouring mountain was made by a number of members from Edmonton. They hoped it might be called mount Edmonton but the Geographic Board disallowed the name though none other was suggested and the mountain remains nameless.

The camp was specially designed to give an official welcome home from the Great War to all members who were on military service overseas, and was held in their honour. There was also present a party from the Alpine Club (England) with which the Canadian Club is now affiliated. Camp was pitched in a sheltered position near the creek. It was singularly warm at night, the cold air sinking to the trough of lake Magog.

The keynote of the climbing was, naturally, mount Assiniboine; not a difficult mountain for an experienced climber but not to be attacked by the novice. It was climbed during camp by 35 members who found it of great interest. The graduating climb was mount Magog, which gave good experience to the beginner. Forty members graduated to active membership. Other peaks ascended were: mount Sturdee, the first ascent; mounts Marshall, Wedgwood, Naiset peak, Wonder peak, mount Towers and the traverse of mounts Magog and Terrapin. An attempt was made on mount Eon but the route chosen was impracticable and the summit was not reached.



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Mount Assiniboine is the centre of a magnificent country affording opportunities for excursions of surpassing interest. Perhaps the most striking was Marvel valley with its chain of lakes and the superb background of mounts Assiniboine, Eon and Aye.

There were present members of the English, Swiss and American Alpine Clubs, the British Columbia Mountaineering Club, the Appalachian Mountain Club, the Mazamas, the Sierra Club, the Royal Geographical Society and the Royal Society.

### APPENDIX No. 3

#### REPORT OF THE SUPERINTENDENT OF MOUNT REVELSTOKE PARK, F. E. MAUNDER, REVELSTOKE, B.C.

The spring of 1920 was cold and backward in this district and consequently the snow was slow in melting, thereby delaying the opening of our work until the 1st of May. At this date the work of clearing ditches and culverts to handle the surface water was commenced and the repair work to the roads continued throughout the season until stopped by snow in the fall.

Repairs on the motor road were very heavy owing to the great volume of water which choked up the culverts and overflowed on to the road, washing out the surfacing. Wherever possible, good side ditches were put in during the season by the sectionmen on the respective sections and the material so removed used on the roadbed. This work practically consumed all the appropriation for repair work but the road was left in good condition for traffic.

During the season permission was granted for the erection of two small cabins for the accommodation of the sectionmen while working on road repair work. Two cabins were erected, one about mileage 4 and the other near mileage 6. These will save the expense of furnishing tents for the sectionmen and also the trouble of moving the same at different times during the season's work. Authority is being asked to have three more of these cabins erected during the coming season.

#### NEW ROAD WORK

Work on the construction of new road from Station 635 onward could not be started until after the middle of July, owing to the snow still lying on the ground. About this time the contractors moved up their outfits and commenced road building operations. Approximately one mile of new road was opened up during the season.

#### FIRE AND GAME PROTECTION

Although the summer was hot and dry, and many forest fires were raging practically all around, we were very fortunate in not having any outbreaks within the park. Nearly every one of these fires started from lightning and it is a miracle that Mount Revelstoke park escaped. Provision having been made in the appropriation for a new trail commencing at a point 12 miles north of Revelstoke, on the Big Bend Government road, to extend along the northern boundary of the park to the head of Silver creek, several days were spent exploring the country in order to locate the most feasible route. About six miles of line were blazed out and then construction was commenced on the building of the trail. Approximately three and one-half miles were completed and then seeing we were getting above the cedar line we decided to erect the warden's cabin. This cabin will in the near future be the headquarters from



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which the patrol of our north boundary will be carried out. There is urgent need of this fire trail being continued right across the north boundary as there is a tract of fine timber along a great part of the route and the trail will be of great service in getting in means to combat fires should they occur.

Along the eastern boundary a fire trail is also necessary and an amount is being asked for in 1921-22 appropriation to provide for the commencement of a trail to Silver creek.

With regard to game protection, as we had no trouble with poachers, we believe that practically all the hunters have acquainted themselves with the new boundaries as established and therefore refrained from encroaching on the park. The new southern boundary, as defined by Order in Council, May 5, was first located by the warden and myself, and later was well brushed out, making it clear. Further, we placed boundary notices and also metal fire notices at all trail crossings, and at frequent intervals along all of this boundary line.

Blue grouse and partridge appear to be multiplying judging from the increased numbers to be seen along the road and trails, and black and brown bear are frequently met. An occasional deer has been seen during the summer, while at the northern end will be found quite a number of caribou.

We were supplied with a portable pumping unit, hose, etc., which will be very valuable in combating forest fires should we be unfortunate enough to have any. The unit was given a test to be in readiness for any emergency, and the warden shown how to run it in case of necessity.

In the late fall a small amount was expended on making some improvements to the ski hill, which is now inside the park boundaries. Considerable grading was done both at the bottom of the run, and above the take-off. A new trestle was erected at the top in order to attain greater speed before taking the jump. These improvements were greatly appreciated by the Ski Club, as well as by the contestants who took part in the competitions. Many of the best ski-jumpers on the continent participated in the sports and several world's records were broken on this hill during the meet. A circuit has been formed comprised of Calgary, Banff and Revelstoke to promote this winter sport, and it is intended to include other towns and cities in this circuit.

## SKI TOURNAMENT

At the Ski Tournament held in Mount Revelstoke park, February 8-9, a number of world's records were broken. Among these was the world's professional long standing jump of 214 feet, made by Anders Haugen at Steamboat Springs, Colorado, broken by Henry Hall, of Detroit, on the Revelstoke hill, who jumped 229 feet. On the same date, February 9, Hans Hansen, of Revelstoke, jumped 221 feet, and in trying to surpass Hall's jump cleared 235 feet, but did not remain standing.

The world's amateur record jump of 185 feet, held by Nels Nelson, of Revelstoke, was broken and the new record of 201 feet established by himself. This jump of 201 feet also establishes a new Canadian amateur record.

The world's record jump for boys under seventeen years stood at 116 feet previous to this meet, but on February 8, Ivend Nelson, of Revelstoke, surpassed his previous year's record by jumping 120 feet. Next day, under better conditions, he established a new record by clearing 133 feet 6 inches, which is the present record for boys under seventeen years of age.

A cash prize of \$500 has been posted for the ski-jumper who is able to break the professional record as it now stands if made on Revelstoke hill.

The contestants included:—

*Professional.*—Lars Haugen, of Colorado; Carl Hall, of Detroit, Michigan; Henry Hall, Detroit, Michigan, present world's champion; Hans Hansen, Revelstoke, B.C.; Barney Riley.



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*Amateur.*—Nels Nelson, Revelstoke, world's champion and Canadian champion; Oliver Kaldahl, Chicago, former boys' world champion; Sigfried Steinwall, champion of Sweden; J. Digerose, of Calgary; I. Nelson, world's champion in boys' class 17 years and under.

#### APPENDIX No. 4

### REPORT OF THE SUPERINTENDENT OF JASPER PARK, COL. S. M. ROGERS, JASPER, ALTA.

#### GAME RESOURCES

The game resources of Jasper park are steadily increasing.

*Elk.*—The 85 wapiti received from Yellowstone National park have thriven well and taken very kindly to their new surroundings. With the exception of a few bad spells of northeast blizzards with heavy snow and extreme cold, the winter conditions permitted these animals to range on the south hillsides, there keeping in the best possible condition. During the prevalence of the severe stormy spells we fed the wapiti with hay at Cottonwood slough, using a few tons of wild hay. This had the result of making these animals quite tame and an interesting number of photographs were taken at close quarters, copies of which were sent to head office.

*Sheep and Goats.*—In the vicinity of Jasper, Brulé and Pocahontas, large herds of mountain sheep and goats are seen almost every day.

*Bear.*—Bear, particularly black and cinnamon, are increasing very rapidly and are becoming tame and bold. This necessitated last year the destruction of some animals which had become a nuisance.

*Moose.*—Moose are moving in the sheltered valleys west to the Divide and the outlook is very promising for the increase of these magnificent animals.

*Deer.*—The different species of deer are thriving and increasing rapidly and last winter, owing to the less heavy snowfall in the valley of the Athabaska, we had a very small percentage of loss from predatory animals. In the neighbourhood of Jasper the mule deer are becoming very tame and are frequently seen in the town-site. On a recent visit to the Maligne range the chief warden observed over 100 deer and 25 sheep. This is the first time sheep have been seen in this locality.

*Caribou.*—One of the wardens who visited the Whirlpool area in March saw 13 of the large Douglas or Mountain' caribou on the mountain side near where the tie cutting work is being carried on. These results of sanctuary protection are very encouraging.

*Fur-bearing animals.*—Beaver, marten, fisher, mink, etc., are increasing rapidly. Marten and fisher in particular are growing so numerous that the question of disposing of some of them is being considered.

*Bird life.*—There is not much apparent increase or change in the description of birds making their habitat in Jasper park, though it is pleasing to note the increasing number of water-fowl permanently settled in the park during the breeding season, particularly the different types of geese and duck.

*Fish.*—The past season was the best yet experienced as regards fishing in the park.



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The following fry were placed in park waters: 10,000 Rainbow trout in Patricia lake, 5,000 in Hibernia lake, 5,000 in Marjorie lake and 24,500 Salmon trout in Pyramid lake.

The rough trail, which is now partly constructed and will be finished the coming season to Dorothy lakes, will open up what has always been considered one of the best chains of lakes in the park.

The continued restocking of lakes in the vicinity of Jasper this year made it possible to open up other new lakes for legitimate fishing and it is hoped that the policy of restocking will be carried out during the coming season so as to popularize this pleasing and healthful pastime among visitors to the park.

*Predatory animals.*—The wardens have been indefatigable in their efforts for the destruction of predatory animals with a very large measure of success. In addition to the usual destruction of coyotes and lynx, two black timber wolves (one extremely large) and two wolverines, were killed during the past winter. In the early part of the winter of 1920 it was feared we would have a serious invasion of timber wolves from the north country, owing to the decimation of game and other animals on which they live, and the wardens were brought in from outlying districts where the snow was too deep to permit of game animals wintering. These wardens covered very successfully the low valleys of the Athabaska and its affluents where the game animals usually range during the deep snow of winter.

The following predatory animals were destroyed: timber wolves, 2; coyotes, 32; wolverines, 2; weasels, 24. In addition numerous crows, hawks and pack-rats were killed.

## VISITORS

Jasper park during the past season was again honoured by a visit from the Vice Regal party, who spent two weeks within the park and visited Maligne lake, Athabaska falls and the Tonquin valley, and in spite of unpleasant weather during a portion of their trip graciously expressed their great pleasure in the visit. The Imperial Press party spent a day here under ideal weather conditions and apparently enjoyed their short experience of motor rides and drives to lac Beauvert (where a barbecue luncheon including buffalo meat was served) and then on to Maligne canyon, the wonders of which drew forth many expressions of praise and interest. Members of the Prairie Club of Chicago also spent a week here and were much interested in what they were able to see in so short a time. Mr. Howard Palmer, F.R.G.S., and Allan Carpe again spent a few weeks exploring the southwest portion of the park and secured a number of interesting photographs of the region of Fortress lake and mount Athabaska.

The Jasper Park Camp at lac Beauvert was at all times crowded to capacity. Unfortunately the lack of accommodation still proves to be a serious drawback to the travelling public who would otherwise come here in large numbers and help this park to fulfil its proper destiny.

## FIRES

Fires originating from the railway line, 39 in number, occurred during the past year with a cost charged in connection therewith of \$445.72. The heaviest item of loss was due to a fire which originated along the railway in British Columbia and which was carried by a strong wind into the park. This was a serious fire and we were fortunate in being able to check it with no great loss. The general fires were largely caused by the carelessness of campers and fishermen. A fire at Brulé which might have been serious originated through the neglect of a smudge fire.



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## TRAILS

Twenty-six miles of trails were added during the year, although the difficulty of procuring and maintaining labour prevented our accomplishing as much as we had planned. All trails in constant use were cleared out several times during the season and outlying trails made passable. As every wind storm causes trouble trails have to be cleared on every trip made by the wardens. The following are the new trails: Athabaska falls to Whirlpool river and Otter creek, six miles; Cavell bridge cut-off to avoid steep grade and rock, shortening trail one-half mile, one mile; Dorothy lake from Caledonia lake, not quite completed, four miles; new trail up Snake Indian river, diversion from old trail to avoid muskeg and grades, fifteen miles.

## CABINS

Six new cabins and three stables were constructed by the wardens and all of the existing cabins repaired. A non-standard cabin has been erected at Rocky river, area number 7, and it is hoped also to build a suitable stable. This area is almost impossible of access and the local wardens were forced to use whip-sawed lumber as ordinary lumber could not be carried in.

## TELEPHONE LINES

The maintenance of our system of telephone lines involves enormous difficulties owing to the large amount of dead timber in the valleys and the heavy wind storms which so often arise in this mountain region. It is hoped that in the near future a system of wireless telephony may be installed which will obviate the interruptions at present unavoidable with the existing system. Trouble was caused to the Jasper-Canyon trunk line several times during the season through pack-rats eating the insulation off the wire in the Canyon shelter. This line was gone over several times during the season. The Jack lake and Maligne lake lines will always be difficult to maintain on account of the heavy snowfalls and high winds in those districts and last year both required heavy repairs. The Jasper-Bedson line has been stretched by falling trees and is so thin that it will soon have to be replaced.

## PERMANENT STEEL BRIDGE OVER ATHABASKA RIVER

The steel bridge at Jasper over the Athabaska river was completed before the winter of 1920 set in, except the concrete flooring and painting. This work will be finished during the early months of the coming season and will render access to the south and east from Jasper safe and passable at all times.

## APPENDIX No. 5

REPORT OF THE SUPERINTENDENT OF WATERTON LAKES PARK,  
G. E. BEVAN, WATERTON PARK, ALTA.

The past year has been one of the most successful in the history of Waterton Lakes park. It is estimated that nearly 14,000 people visited the park, an increase of 40 per cent over the preceding year and a large advance over any previous record. These were drawn not only from the adjacent towns but from every part of Canada and many foreign countries as well showing that the beauties of this unique park are becoming very widely known. The number of visitors from the United States, the



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majority of whom came on from the United States Glacier National park, is an indication of the probable future interchange of traffic between these two parks when the projected motor roads are completed.

## WATERTON TOWNSITE

Many inquiries were made at the Administration office for building lots this year and much disappointment was expressed upon finding that the lots surveyed and plotted last year were not open for application. It is apparent that as soon as these are open a large number will be applied for and buildings erected thereon.

## OFFICIAL BUILDINGS

*Headquarters.*—In addition to the small house and office erected in 1919, a commodious bunkhouse and dining room for the workmen and a very suitable garage and repair shop for the proper care of cars used in the parks service were built during the year.

*Warden's Stations.*—The stations at Castle river, (District No. 5) and Mill creek (District No. 4) were each equipped with a log cabin and a combined stable and hay barn, while at Yarrow creek a suitable hay barn was also erected adjacent to the present log stable.

A large and well equipped stable to hold at least twelve horses is urgently needed at Headquarters and this will be asked for in next year's estimates. A building suitable for an implement shed and general storeroom is also required. At Belly river a cabin and combined stable and hay barn is badly needed and I would strongly recommend a stable and haybarn at Pass creek.

## ROADS

The constant repair work which is being done on our roads is bringing them each year into better condition. Section men are maintained during the season going over all roads, raking the rocks, filling ruts, widening narrow places and straightening curves. By this constant supervision we are able to keep them in excellent condition and they drew forth many expressions of appreciation from our motor visitors last year. The Pincher creek addition, commenced in 1919, was completed early in the season in time to be utilized by the tourists. The Cardston extension, from Waterton bridge to the east boundary of the park, was not completed until late in the fall. It is, however, a standard road and while only of earth construction will be much appreciated the coming season.

A road from Waterton bridge almost due east to connect with our warden's station on Belly river is urgently required so that the affairs of the park in this area may be satisfactorily and economically conducted. the more so as this road will one day become a main highway connecting this park with Glacier park in Montana via the valley of the Belly river. The projected road from Waterton townsite via Cameron creek to Akamina pass at the Interprovincial boundary is also much desired. This will be the branch's contribution (14 miles) towards a road which, by co-operation with the British Columbia authorities and the United States Glacier park administration, will give access to the park roads in Glacier park via the Kishenena pass and the Flathead river and will eventually connect us with their park-to-park highway system, besides which it will encourage motor traffic into Waterton Lakes park. Both the above projects when completed will be the initial roads towards a project which embraces a circular motoring route covering approximately 250 to 300 miles as follows: From Waterton lakes westward via Cameron falls, Oil City and Cameron lake



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over the continental divide into British Columbia: via Wall lake, Akamina and Kishenena passes across the International boundary to the Flathead river, passing by the Kintla lakes and Agassiz glaciers; thence following down this river to Belton, Montana and lake McDonald, then across the southern portion of the Glacier National park to Glacier hotel at the eastern park entrance. From this point the international highway is followed north to the Many Glaciers hotel on lake McDermott, via Two Medicine, Sun Camp and St. Mary's chalets. From Many Glaciers down the Swift Current pass, Kennedy creek, lakes Glenn and Crossley, down Belly river across the International boundary to Waterton lakes, via the Crooked creek basin, Stoney creek divide and Blakiston brook.

Needless to say the scenic features of this projected route are most alluring while at the same time Waterton Lakes park will be placed upon the park-to-park highway project of the United States system and, later, way will be found, probably via Flathead river, to Michel, British Columbia, or a shorter pass may be located to connect with Elko, which would then connect us with the Banff-Windermere highway.

#### TRAILS

No new trail work could be undertaken during the past summer owing to the difficult labour situation. The existing trails, however, were all gone over and put into good condition by the wardens.

#### TELEPHONE LINES

The park now has in operation approximately 50 miles of single wire grounded telephone lines, mostly suspended upon poles. Such of our lines as are attached to trees are very unsatisfactory owing to the swaying of the trees weakening and breaking the wires. For this reason some of the old lines will shortly have to be rebuilt. Approximately 8 miles of construction were undertaken during the past year and the Pass creek telephone line was extended to the Forks cabin. For fire protection and general efficiency our single wire grounded telephone line is without a doubt very serviceable. During this season the Alberta Government built a telephone circuit from Pincher creek to Cardston and connection was given this park, thus establishing for the first time in its history direct connection with outside points. This will add much to the general efficiency of our administration.

#### TRANSPORTATION

The department during the year issued to the park a Reo speed wagon. This is a splendid type of transportation truck for this park, our sources of all supply being 40 miles distant. Provincial roads both north to Pincher creek and east to Cardston, while leaving something to be desired in way of grading, are otherwise excellent and our transportation difficulties, always a serious item, are now largely met.

#### GRAZING

Following the dry season of 1919 and the consequent close grazing of the park, it was considered advisable to reduce the number of permits this season so that the natural browse and forage should have an opportunity of recovering. For this reason only 1,912 head of stock were permitted as against 2,916 during the previous season. The result was very noticeable and recovery showed all over our grazing areas. Strict watch was maintained and trespassers impounded.



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## FIRE AND GAME PROTECTION

As compared with the previous year our fire season was not so exacting. Although the summer was very dry and fires broke out in the park neighbourhood, we escaped with only one fire. Prompt action from headquarters controlled this at Black Tail point and it was extinguished without trouble or incident. Our small portable fire engine here alone demonstrated its value.

Notwithstanding an exceedingly dry summer, which destroyed the natural browse of our wild life, and an exceptionally early, protracted and late winter in 1919-20, the losses of big game were surprisingly small. The greatest loss was noticed in early lambs and fawns, which died largely as a result of the many severe snowstorms. Consequently few young can be seen with their dams. The present season has been surprisingly open and free from snow. Hence this season we expect better results.

The usual herd of Rocky Mountain sheep have again made the west slopes of Sofa or Sheep mountain their winter range and large numbers have daily been observed. A quantity of rock salt placed on the point at the Narrows has attracted them to the immediate neighbourhood of the town. The herd of elk ranging in the north end of the park near Castle river appears to be increasing. Beavers are very numerous in the park and workings are extensively observed in the shape of dams, houses, etc. Branches of trees cut for food are evident everywhere and the various colonies excite considerable interest amongst the tourists, who are never tired of watching these busy little animals. Bears also are becoming numerous but they very seldom commit any depredations.

In the latter part of the year two bands of wolves settled in the park coming in presumably from either British Columbia or United States. The services of Mr. Henry Riviere, provincial game warden, were secured and a war of extermination commenced. To date one male wolf has been shot by him and as no further reports are forthcoming it would appear he has driven the others out.

In addition a mountain lion also made its appearance on the eastern slope and commenced depredations in the north end of the park.

The services of an expert hunter, J. Morden, to supplement the wardens' efforts were also secured in this case with the result that on March 29 a lion measuring 7 feet 11 inches from tip to tip was shot.

## FISHING

This most popular sport has been excellent in the lakes this year, many enthusiastic anglers having secured their daily limit upon several occasions. Considerable excitement was occasioned amongst the visitors on July 8 when a Lethbridge lady, Mrs. C. Hunter, brought to shore a lake trout weighing 51 pounds which she caught, played, gaffed and landed in her boat without any assistance. Although many efforts were made to beat this record catch, needless to say, it still stands. These old fellows are unusually cute and seldom take the hook.

During July, the co-operation of this administration was sought by the United States Glacier Park authorities in providing transportation for a shipment of Cutthroat trout fry for disposal in the headwaters of Waterton and Belly rivers respectively. This was gladly accorded and the deposit made. During the long road trip great care had to be taken of these delicate little fellows but the project was fairly successful. In this connection I would recommend that an effort should be made to secure for this park stocks of fish from the hatchery at Banff. Bertha lake and Cameron lake, ideally situated as they are, have not a fish in them. These should receive first attention and application will be made in due season for shipments to stock these two waters. There is no sport in our national parks which appeals to visitors more than good fishing. A permanent fish hatchery would be a great acquisition.



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## VISITORS

The attractions of this park as a holiday resort are abundantly evidenced by the very gratifying increase in the number of visitors from year to year. This increase is largely made up of newcomers visiting us through the advice of their friends. No advertising has been done except that of satisfied visitors. Moving pictures, showing the various holiday recreations indulged in during the summer, would be a very effective means of bringing this park more prominently before the public. In these days of the motor car, the early transportation difficulties are forgotten and travel to and from the park becomes a delightful part of the holiday.

## RECREATIONS

Boating and fishing are the chief sources of recreation but saddle-horse trips, mountaineering, valley hikes, must not be overlooked as means of enjoyment. Every evening of the season dances are held at the local pavilion and as a means of bringing a somewhat full day to an end, this provides a very enjoyable climax.

In the spring of this season a special appropriation was made for the purchase of children's playground equipment. This was very popular and highly appreciated, not only by the little ones but also by their mothers. The fathers also were interested to the extent that inquiries were made at our office for addresses of firms supplying such equipment and the matter brought to the attention of local school boards.

## LAW AND ORDER

The responsibility of maintaining law and order again fell upon the detachment of the Royal Canadian Mounted Police sent here for that purpose by the officer commanding the Macleod division. A corporal and one caretaker were in charge of the park and their mere presence was sufficient to prevent any petty larcenies or disorderly conduct. The fact that we are so near the International boundary and that the opening up of a roadway via British Columbia to connect with the United States Glacier National park is now being projected would seem to warrant the establishment of a permanent post here. Customs duties and international travel could then be controlled.

## FARMING OPERATIONS

An area of approximately 200 acres was enclosed with new wire fence during the season of 1920 and about 20 acres were newly broken and seeded to oats. Our success in growing our own forage for our horses fully warrants any reasonable expenditure along these lines. The wardens at each end of the park were also similarly provided with small farming areas. Owing to the lateness of the season and to the fact that the headquarters farm was first attended to, these areas were not quite the success we had anticipated, nevertheless, such results as were attained go to show that these establishments can with perseverance be made self-sustaining for horse forage and the large expense involved in the purchase and transportation of feed, owing to their isolation, can be eliminated.



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## APPENDIX No. 6

REPORT OF THE SUPERINTENDENT OF BUFFALO PARK, A. G. SMITH,  
WAINWRIGHT, ALBERTA

## FARMING OPERATIONS

Approximately 440 acres were seeded to oats and rape again this year, of which 200 acres were summer-fallowed. The rape did not grow quite so well as it did the previous year but the oat crop was much better. About 75 acres were cut for green-feed and from the balance a sufficient quantity of oats was harvested to supply not only the requirements of this park, including seed for the coming year, but also Jasper park and Elk Island park until next year's crop is available. Two thousand bushels were also sent to Rocky Mountains park. The good crop gave us considerable more straw and this, mixed with rape leaves, made excellent feed for the buffalo.

For further experimental purposes it was decided to try white clover and about the end of June a 5-acre plot was seeded and a fair catch obtained.

About 200 acres were summer-fallowed again this year and left in splendid shape for seeding in the spring.

*Haying.*—This has been the most successful year we have had in putting up hay. In all about 900 tons were cut and stacked, 800 tons on the Ribstone meadow, the balance upland hay cut in the cattalo enclosure. The hay cut on the Ribstone meadow was all this year's growth. It contained no old bottom and was well saved.

In addition to the hay cut for ourselves, permits covering about 100 tons, issued for small lots, were granted to farmers living in the vicinity of the park.

## GRAZING LEASES

As in former years those sections of the reserve outside the fence on the east and west sides of the park were leased for grazing purposes, which was not only a convenience to the cattle owners in the vicinity but also served to bring in considerable revenue.

## FIRE-GUARDING

The fire-guards on the south and east boundaries of the park, also those around winter quarters and the home paddock were ploughed by our own teams. No fires occurred in the park during the year.

## FENCING

Between 50 and 60 miles of fence on the west, north and east sides were gone over and repaired. As this fence was in bad shape it took a great many new posts to put it in a safe condition. Fences surrounding the home paddock and farm were also gone over and repaired.

## TIMBER PERMITS

Each year a larger number of farmers are securing permits for obtaining dry wood in Buffalo park. This year 46 permits were issued and as each permit covers 25 cords it will be seen that this privilege is a great benefit to the settlers. Permits were also granted to farmers covering 10,500 willow fence pickets, and this is also a very great help to settlers living in the vicinity of the park who have no fence pickets on their own farms.



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## NEW BUILDINGS AND IMPROVEMENTS

Several new buildings were erected this year. A storeroom and garage at the superintendent's quarters, an oil house at the farm, a cook camp at the Ribstone meadow, a machinery shed in the home paddock, a cottage and barn at the Rocky ford and a cottage and barn in the cattalo enclosure, the latter being erected for the Department of Agriculture.

The superintendent's residence and office were veneered with brick during the year. This was a decided improvement and one which is much appreciated.

## HORSES

During the year other Dominion parks were supplied with 37 horses from this park, and we have on hand at present, including colts, 69 head. There was an increase of five colts.

## WILD ANIMALS

The feed this year throughout the park was much better for the animals while on the summer range and they have come through the winter in good shape. The natural increase in buffalo for the year has been 543, and the herd now numbers 5,152. It will be of interest to note that the total increase in buffalo for the last four years has been 2,898, which is 500 more than double what the herd numbered four years ago. The elk and deer are also increasing rapidly.

The decrease in buffalo for the year was 59, of this number 21 were slaughtered and 7 sent to Banff.

Our records show the number of wild animals now in the park to be as follows: buffalo, 5,152; elk, 155; mule deer (estimated), 419; moose, 23; antelope, 4; cattalo, 15; yak, 5; domestic cattle, 16. Total, 5,789.

The cattalo experiment being carried on in this park by the Department of Agriculture is very interesting. The practice of raising buffalo calves on domestic cows and allowing them to grow up together with domestic and yak calves promises to be the surest and quickest way of arriving at the results desired.

## WILD BIRDS

Every year larger flocks of wild fowl are to be seen within the park. Many of these return to their breeding and feeding place each year, while many others seem to realize the protection afforded them when migrating and are to be seen at that time on and around the small lakes in the park. A great many different species of bird life are to be found.

## COYOTES

The hunting of coyotes with dogs has been kept up again during the winter, and, including a few shot by the wardens, 59 of these animals were destroyed.

## VISITORS

A visitors' register is now kept at the entrance gates and the records show that more people are visiting the park each year. This year four special excursion trains, including the Imperial Press Association, came to Wainwright for the purpose of seeing the world's famous buffalo herd, and on the pages of our visitors' register can be found the names of people from every part of Canada, from twenty-three different states of the American Union, and from England, Scotland, Ireland, the Channel Island of Jersey, Sweden, Holland, South Africa, South America and Barbados island.



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## APPENDIX No. 7

REPORT OF THE SUPERINTENDENT OF ELK ISLAND PARK,  
ARCHIBALD COXFORD, LAMONT, ALTA.

As the spring of 1920 was very late, we were compelled to feed the animals up to the last week in April.

The first spring work was as usual the burning of long grass in the sloughs around the park fence which was likely to prove a firetrap; the grounds were then cleaned up and the brush cut between the fence and the road on the north side of the park, to better protect the fence from fire. We then went over all the fences and made the necessary repairs. This is work where I find the great advantage of having a rider. It is very important that the fences be kept in first class shape and they require almost constant watching, particularly now that the park is becoming so crowded with animals.

I considered it advisable to widen the fireguard on the south of the park for about  $2\frac{1}{2}$  miles so had the brush cut 16 feet in width. In June and July, I had the whole fireguard ploughed and the new piece broken out. In October, I had it all disked and the roots grubbed out of the new piece. This work was very thoroughly done.

The usual repairs were made to the roads such as grading up some of the low places, putting in culverts and dragging the main entrance road with a split-log drag.

The interior of the superintendent's house was altered so that an office might be provided. I find this a great improvement. A garage was also built for the Reo truck that was shipped from Banff.

Haying operations commenced the last of July. About 350 tons of good hay were stacked for winter feeding. Advantage was taken of a very open fall to start the cleaning up of a piece of ground for sports. This work is not completed.

The animals came through the winter in good shape. The number in the park on March 31 was: buffalo, 230; moose, 67; elk, 174; mule deer (estimated), 150. With the animals increasing every year we are crowded for room. I would advise extending the park south for at least five miles as the range is crowded and if we have another hard winter the animals ranging out all the time will suffer.

## APPENDIX No. 8

REPORT OF THE SUPERINTENDENT OF POINT PELEE PARK,  
F. H. CONOVER, LEAMINGTON, ONT.

The past year has been a very successful one at Point Pelee park both as regards the growing number of visitors and noticeable increase of bird life. The improved appearance of the park, its general cleanliness and order, as well as the good condition of the roads have been the subject of many commendations.

In the month of April a rustic arch, bearing the name "Point Pelee Park" was erected at the park entrance. The arch is artistically designed and well constructed and makes a very attractive addition. The cleaning up of debris and underbrush was also steadily carried on, thus materially lessening the fire danger as well as improving the appearance of the park. The roads were put into good condition, ruts filled in, waysides mowed, stumps and roots along the roadsides removed and gravel and sand applied where necessary. During the first part of the season the main roadway in the park was scraped and lightly graded. Clay was then hauled from the Point to give a good bond to the road and a top dressing of gravel from the beach spread



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over this by hand. This made an excellent road and in spite of the heavy travel of the summer it stood up well.

A frame engine and tool house with concrete foundation and floor was completed and the building given two coats of olive green paint.

During the year the Cottontail rabbits in the park increased in such numbers as to become troublesome to the settlers living on the Point. During the winter they destroyed a number of fruit trees by girdling the bark, as well as many native shrubs, and in the early summer did considerable damage to garden plants. As a result permission was granted to settlers to shoot rabbits on their own property. As is well known, however, once rabbits have become numerous there is no satisfactory method of getting rid of them except by a general drive, and during the winter, as the depredations continued, it was decided to adopt this form of attack. The neighbouring sportsmen were invited to participate, and on the 14th of January sixteen shooters assembled and under the direction and leadership of the superintendent and warden formed a long line across the park reaching from the edge of the marsh to the lake. When the word was given they advanced south in a crescent-shaped line, driving the rabbits before them. The drive lasted about five hours, and at its close the count showed that 122 rabbits had been destroyed. As it was believed that a number had escaped on account of the thickness of cover, a second drive was inaugurated a little later, but only a few rabbits were secured, showing that they had been practically cleaned up in the first drive.

Considerable attention was also given to the question of the elimination of carp and dogfish from the Pelee marshes. These predatory fish infest the park waters and have become so numerous that they are practically eliminating all game fish. In addition, they eat and destroy the marsh vegetation, particularly the wild rice on which ducks and other water-fowl feed. As carp do not respond to hook and line, the only practical method of capture is by netting, and during the spring the department took up the question with the provincial authorities and it was decided to allow permits for seine fishing for carp in the Pelee waters. It is too soon at the time of writing to tell what the results will be, but it is hoped that the numbers of these noxious fish will be materially lessened by these means.

With a view to improving the supply of plant foods for wild bird life, a quantity of wild celery and rice seed was planted in the waters of the larger ponds and lakes. The local sportsmen subscribed about \$100 to this fund, the rest of the amount required being provided by the department.

In view of the large area of the park and the presence and formation of the marsh, I would point out that there is urgent need for more patrol assistance to prevent violations of the park regulations.

## APPENDIX No. 9

### REPORT OF THE ST. LAWRENCE ISLAND PARKS

The St. Lawrence Island parks, which comprise thirteen islands and one mainland reservation among the Thousand Islands of the St. Lawrence river between Morrisburg and Gananoque, continue to justify their existence more and more from year to year. They are now practically the only places on the Canadian side where campers and picnickers are free to go, and the increasing use which is annually made of them indicates what a valuable service they render the general public. By obtaining a permit from the local caretaker campers may secure a camp site with the use of a stove and other conveniences free of charge, and last year large numbers of people availed themselves of the opportunity to enjoy an inexpensive and healthful holiday



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in this way. Organizations such as the Boy Scouts and Girl Guides also held camps on the islands and many Sunday schools and churches in the neighbouring towns and cities made use of them for their annual outing. So many applications were received for the latter on some of the islands that it was necessary to arrange dates in advance.

The island parks are inspected twice a year by an official from head office, who sees that the wharves, paths, buildings and other conveniences are kept in good repair. Local caretakers are in charge and maintain general cleanliness and order. Last year a number of large signs giving the name of each park were erected so as to be easily legible from the river. This was a great improvement on the old signs, "Dominion Lands, No. —," which were the cause of considerable confusion. Minor repairs were undertaken where necessary.

The new Border Island park opposite the town of Morrisburg was largely patronized throughout the summer, and promises to become one of the most popular of the island resorts. A large pavilion is needed for this park to serve as a shelter in the event of storms, but our appropriations last year would not permit of its erection. A large military tent, however, was erected, which answered the purpose temporarily very well.

## APPENDIX No. 10

REPORT OF THE HONORARY SUPERINTENDENT OF FORT ANNE  
PARK, L. M. FORTIER, ANNAPOLIS ROYAL, N.S.

During the past fiscal year we have made an addition of a considerable number of interesting articles to the Fort Anne park museum and library, the most interesting being the Savary bookcase completely filled with books bearing on the history of Port Royal and Annapolis.

This bookcase has on its front a brass tablet bearing the following inscription: "From the Library of Alfred William Savary, M.A., K.C., D.C.L., Judge of the County Court, Member of the Nova Scotia Historical Society, First Hon. President of the Historical Association of Annapolis Royal. Presented to the Commission in charge of Fort Anne by his sons, as a Memorial of him, and in commemoration of his constant interest in all matters pertaining to the Fort and the History of his native Province. A.D. 1920."

The formal "unveiling" and dedication of this interesting memorial took place on August 30, 1920, in the presence of the mayor and councillors of Annapolis Royal and some visiting strangers, among the latter the Rev. G. Whitfield Brooker, of Freeport, Nova Scotia, who delivered a particularly striking address.

We have been successful in procuring copies of several rare and interesting books outside of the Savary collection, and it seems probable that at no distant date the library of Fort Anne will contain practically every book, and a copy of every map or plan, on the past history of this place.

A number of interesting trophies of the recent great European war are now displayed in our visitors' room, and more are coming.

On December 17, 1920, Fort Anne was honoured with a visit from His Excellency the Governor General, the Duke of Devonshire, who spent a little time here and gave an address from the doorstep of the Administration building.

The tourist season this year has been particularly heavy, and Fort Anne has attracted a remarkable degree of attention. We had during the season something over 6,000 visitors to the Fort, 3,800 of whom wrote their names in the visitors' book and received personal attention, all, I think, going away well pleased with what they saw here and the attention paid to them, and determined in a great many cases to come back and bring or send their friends.







## PART III

# FORESTRY

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### REPORT OF THE DIRECTOR OF FORESTRY, R. H. CAMPBELL

This report covers the work of the Forestry Branch for the fiscal year 1920-21, ended March 31, 1921.

The process of readjustment in all lines of life following the war and post-war periods was reflected in the conditions prevailing in the western provinces in connection with the administration of forest reserves and forestry generally. During the year the price of farm products declined, while at the same time efficient labour continued scarce. The result was that there was a slackening in some lines of activity on the part of settlers and not the increase in other lines that there would have been under more normal conditions. The number of individual permits issued to settlers to secure timber of various kinds on forest reserves increased by slightly over 200, whereas there was a decline in the quantity of saw-timber and building logs taken out. On the other hand, the quantity of fuel cut increased by about ten thousand cords, and the quantity of mine timber cut was more than double that of the previous year. There was a slight decrease in the number of stock grazed and in the quantity of hay cut, while the demand for tree seedlings for planting shelter-belts on farms was about the same as the preceding year. In spite of these mixed conditions, the total revenue increased from \$127,975 to \$143,812.

Weather conditions were better for forest protection because of increased moisture in early spring, and losses from fires were reduced as compared with the preceding year. The year witnessed the first use of airplanes in forest protection in Western Canada.

#### FIRE PREVENTION AND SUPPRESSION

In the western provinces there was considerable variation in the fire-hazard as between different districts. In Saskatchewan and Alberta the fire season was almost normal; in Manitoba the conditions were hazardous, though losses were small; and in British Columbia the emergency season was one of the most difficult with which the Forestry Branch has had to deal, although damage was confined to the district east of the Cascade range. In the latter district numerous violent electrical storms occurred which caused a large number of lightning fires; in fact, fires from this source attained the unprecedented figure of 40 per cent. Fairly well throughout the West, the snow remained late in the spring, so that the danger usually experienced at this time did not develop. During the summer and early autumn, however, there occurred a period of hot, dry weather, during which a number of fires started. As compared with the preceding season, the total number of fires occurring throughout the four western provinces increased by 219, but the area burned over and the amount of timber damaged or destroyed were very much smaller.

It is always of considerable value to know how fires originate, as such a study makes possible the application of preventive measures. For a considerable number of years past it has been necessary to designate the cause of a large percentage of fires as "unknown." The percentage of unknown fires for last season, however, shows



a considerable reduction, which may be taken as an indication of material improvement in the attention given to study of the fires. Fires caused by railways reached the total of 45 per cent, which is an increase over previous years, and was probably caused by heavy traffic during the danger period and the use of inferior grades of coal. Lightning fires increased to 10 per cent, which is about twice the normal. In other respects the statistics show that the relative percentage of fires attributable to the various human agencies other than those mentioned above remained approximately stationary. Right-of-way conditions along railways were somewhat improved, but still further action is necessary, especially upon the newer and smaller branch lines.

The total number of fires for the season was 1,532 as compared with 1,313 for the preceding season. There was, however, a reduction in the proportion of large fires (that is, fires burning an area of ten acres or more), 27 per cent falling into this class, while in 1919 the number of large fires was 40 per cent of the total. The total area burned over was 485,500 acres, of which approximately 110,000 acres was commercial timber, 152,600 acres young growth, the remainder being open or grass lands. As a result of uncharted fires in the more inaccessible regions of northern Manitoba, a considerable area, the figures for which cannot be included with the above, was burned over.

FIRES WITHIN FOREST RESERVES

Cause	1920		1919		1918	
	No.	%	No.	%	No.	%
Unknown.....	43	20	79	36	46	40
Campers and travellers.....	28	13	30	14	23	20
Settlers .....	11	5	26	12	15	13
Railways.....	94	44	46	21	13	11
Lightning.....	27	12	9	4	4	3
Lumbering.....	2	1	12	5	5	4
Incendiary.....	2	1	6	3	7	6
Brush disposal other than by settlers..	2	1	5	2	3	3
Other known causes.....	7	3	7	3	.....	.....
Total.....	216	100	220	100	116	100

FIRES OUTSIDE FOREST RESERVES

Cause	1920		1919		1918	
	No.	%	No.	%	No.	%
Unknown.....	200	15	262	24	200	26
Campers and travellers.....	187	14	122	11	106	14
Settlers.....	106	8	212	20	190	24
Railways.....	596	46	372	34	191	25
Lightning.....	138	11	48	4	41	5
Lumbering.....	24	2	15	1	17	2
Incendiary.....	16	1	16	1	8	1
Brush disposal other than by settlers...	16	1	18	2	10	1
Other known causes .....	33	2	28	3	19	2
Total.....	1,316	100	1,093	100	782	100



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## TOTAL OF ALL FIRES ON DOMINION LANDS

Cause	1920		1919		1918	
	No.	%	No.	%	No.	%
Unknown .....	243	16	341	26	246	27
Campers and travellers. . . . .	215	14	152	11	129	14
Settlers.....	117	8	238	18	205	23
Railways.....	690	45	418	32	204	23
Lightning.....	165	10	57	4	45	5
Lumbering.....	26	2	27	2	22	2
Incendiary .....	18	1	22	2	15	2
Brush disposal other than by settlers...	18	1	23	2	13	2
Other known causes .....	40	3	35	3	19	2
<b>Total.....</b>	<b>1,532</b>	<b>100</b>	<b>1,313</b>	<b>100</b>	<b>898</b>	<b>100</b>

## IMPROVEMENTS

A fundamental requirement for forest administration and fire protection lies in the provision of communication facilities in the forest. Rapid communication from point to point is necessary for the adequate control of fires, and also is a great aid to ordinary administration; to secure these ends specially constructed telephone lines are used. Roads and trails are necessary for the movement of men and supplies for both protective and administrative work. Buildings for the accommodation of forest officers and storage of equipment, and lookout towers for fire detection, are also essential improvements. Each year, therefore, all the funds which can reasonably be devoted to such construction work are used in providing telephone lines, roads, trails, lookouts, and other improvements of this nature.

Very material progress was made in the improvement plans of each district during the year, the sum of \$72,790 having been expended on this work; this expenditure was, however, supplemented to a considerable extent by the use of ranger labour. When not otherwise engaged in fire protection and administrative work the entire staff, permanent and temporary, is used for construction work, thus increasing the amount of work which would otherwise be possible. The following table indicates the amount of improvement work which was brought to a state of completion:—

Number		Miles	
Cabins (Class C) .. . . .	5	Telephone lines.. . . .	95
Ranger station houses.. . . .	2	Roads.. . . .	52
Stables and barns.. . . .	6	Trails.. . . .	47
Other buildings.. . . .	11	Fireguards (ploughed) .. . .	13
Lookout towers.. . . .	5		

In addition to the foregoing, however, numerous improvements, previously reported, were repaired and maintained; also, a considerable number of new projects were started which for various reasons could not be completed within the year. By consistent work of this kind, from year to year, the reserves should within a reasonable time be fairly well provided with the facilities required.

## AIRPLANES IN FOREST PROTECTION

During the season of 1920 the Air Board of Canada inaugurated an airplane patrol over certain of the forest areas in charge of the Forestry Branch. Two patrols were established, one in the Alberta inspectorate and the other in the British Columbia inspectorate. In both cases, however, it was not possible to begin the patrols until the fire-hazard season was virtually over. The Alberta station was at Morley and from there the machines made their first flights in September, while the first flights



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from Kamloops and Sicamous, the British Columbia bases, were not made till early November. In spite of this a number of trips were made and the result was to convince forest officers that the airplane will be of great utility in forest work, such as exploration, mapping, fire patrol, inspecting insect infestation, etc.

#### GRAZING

On the non-agricultural lands set aside as forest reserves there are considerable areas, which have been denuded of timber but which with protection will, in time, bear another crop. In the meantime, that the crops of native grasses which they bear may be made as useful as possible to the surrounding settlements, the grazing of cattle, horses, and sheep is permitted under proper regulations. There are also other areas in the midst of forest reserves, especially in the Rocky mountains, which while unsuited either for agriculture or for tree growth, are composed of fair pasture land. To these also stock is admitted. The settlers in the West have readily availed themselves of these privileges and the number of stock grazed increased steadily until the season of 1920, when there was a slight falling off in numbers. This is accounted for wholly by pasturing and market conditions. The season of 1919 was exceedingly dry with a shortage of feed, followed by a winter of heavy snowfall, which caused many stockmen to reduce their herds. In the spring of 1920 the farmers felt that they could not purchase stock to fill up their herds at prevailing prices, and many, who had grazed their cattle on forest reserves in the past few years, found their own lands sufficient to carry their stock. The total number of stock grazed in the summer of 1920 was 90,724, a decrease of about 8½ per cent from the preceding year, but that this was not caused by lack of interest on the part of farmers and ranchers is shown by the fact that the number of permits issued to individual stock-owners was 1,757 an increase of 104 over 1919, or of about 6 per cent; thus more settlers are taking advantage of grazing privileges even though the average number of stock each owner pastures is temporarily lessened. In all the provinces the number of stock associations has increased which is indicative of the growing favour with which stock-owners view the co-operative use of forest range. These associations, in addition to aiding in the management of the herds, are also gradually eliminating scrub stock, with the result that the quality of the stock now grazing on forest reserves is much higher than formerly.

During the summer the policy of carrying out grazing surveys was continued, and additional detailed grazing type maps were compiled and other information obtained, by means of which the number of stock which can be carried in the various grazing districts can be more accurately determined. Another improvement in grazing conditions is the extension of the plan of grazing in summer only on the reserves. Under this plan the stock are fed hay and other stored feed on the owner's farm during the winter and early spring, and this saves the range from the damage often resulting from the running of stock at those seasons. An incidental advantage of this plan is the opportunity it gives for eliminating all stray and unauthorized stock from the ranges.

#### SILVICULTURE

Under this heading are grouped all the operations connected with the handling of timber on the reserves, looking to the development of the same as a growing crop and to its ultimate harvest. The object is not only to provide the surrounding communities with all the fuel and timber possible for the next few years but also to get the forest into the highest state of production, so that the largest possible supply of good timber may be available from each of these forests in perpetuity. To this end efforts are directed toward the cutting of mature and overmature timber, and especially to the removing of all dead and diseased trees, that a new crop may spring up



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and grow as speedily as possible. The cutting is closely supervised to prevent waste in high stumps and large tops left in the woods, and to see that all the slash from the cutting operations is piled and burned, so as to remove this form of fire-hazard. One feature of silvicultural work in the past year was the campaign to combat and wipe out a dangerous infestation of western yellow pine by bark beetles. By this action this outbreak has been greatly lessened, if not entirely removed. In regard to the permits issued to settlers to cut timber for their own use for fuel and building, these show an increase of about 200, indicating that increasing numbers are taking advantage of this privilege. The quantities of saw-timber, mine timber, building logs, fuel, etc., taken out on the various reserves differed considerably according to the markets and the conditions of the roads, but on the whole were slightly less than in the preceding year. This was caused partly by the falling off in building operations and partly by the exceedingly deep snow in some localities in the winter of 1919-20. An interesting development was the number of inquiries received as to the possibility of obtaining pulpwood on the reserves, which may indicate a possible method of utilizing some classes of timber at present of low commercial value.

## PLANTING ON FOREST RESERVES

Planting trees and sowing tree seed on forest reserves is done for two purposes: first, to restock the area with some desirable species, which has become extinct or nearly extinct through repeated fires in years gone by, and second, to furnish data as to the best methods of planting and seeding, the rate of growth, etc. These experimental plantings were greatly increased during the year. Approximately 58,000 Scotch pine, jack pine, and white spruce seedlings and transplants were set out in twenty-seven plots aggregating about twenty acres. A large part of the planting stock was furnished from the Forest Nursery Station at Indian Head, Saskatchewan, and the remainder came from small nurseries established on various reserves. In addition to the above, nineteen experimental plots covering approximately twenty-five acres were sown with seventy pounds of tree seed, about evenly divided between white spruce and jack pine.

## RECREATIONAL USES OF FOREST RESERVES

It is natural that people should desire to make use of the forest reserves for recreational purposes, and, under proper supervision and regulation, this is desirable from the forest administrator's standpoint. People who spend their holidays in the woods, whether simply in camping or in hunting and fishing, get a good idea of the value of forest resources and thus become active agents for forest protection. In desirable locations along the shores of lakes in different forest reserves plots are leased to citizens on condition that they erect suitable houses and keep their surroundings in good order. The number of these cottages is steadily increasing, although progress in this respect has not been so rapid in the past year, owing to the business depression. Fishing is one of the great attractions for tourists and cottagers, and the policy of the Forestry Branch is to maintain good fishing, by stocking the lakes with fish fry, when necessary, and by restricting the method of taking fish to angling. The efforts in this direction are meeting with success; and in the matter of fish and game protection the Forestry Branch acts in co-operation with the Dominion fishery authorities, on the one hand, and the various provincial game wardens on the other.

## TREE PLANTING ON PRAIRIE FARMS

The officers in charge of the tree-planting work report increased interest in this subject in all parts of the Prairie Provinces. The experiences of the past few years have impressed on prairie farmers the great benefits of having belts of trees across



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their farms and about their farm buildings. The injury that has been done to many farms by soil-drifting has led to the discussion of tree planting as a remedy at farmers' meetings and in the press. The planting inspectors note that the ground is being better prepared to receive plantations, and that the plantations are being better cared for than in the past. The year 1920 was a satisfactory one for plantations, except those in certain districts, where precipitation was very light. No general injury was reported during the year from insects or winter-killing. The growth of broad-leaved stock on the Nursery Stations was, on the whole, favourable. The coniferous species, however, suffered severely in the transplant plots and seed-beds, owing to hot, dry weather, with high winds at planting time and for a few weeks following. The number of applicants for stock to plant in the spring of 1921 was about the same as for 1920, namely approximately 8,000. Conditions in agricultural districts are unsettled. Labour is still scarce, wages high, and the price of produce has fallen greatly; consequently many farmers, who are anxious to plant, are unable to do so, because of lack of help or funds. As soon as more normal and settled conditions return there is every indication of increased activity in tree planting on the prairies.

#### FOREST PRODUCTS LABORATORIES

The work of the Forest Products Laboratories of Canada, which had been seriously interfered with by the drain of trained men during the war and the period of activity immediately following, was swung back toward normal, and by the end of the fiscal year had re-attained a satisfactory state of efficiency. In addition to carrying on the work of testing all Canadian woods to determine their mechanical and physical properties (one of the main lines of activity of the Laboratories) investigations were pressed forward in regard to methods of utilizing decayed aspen, the decay of pulpwood, decay of timber in buildings, Nova Scotia mine timbers, railway cross-ties, paving blocks, etc. The cross-tie investigation involved, in addition to laboratory tests, the placing of a number of treated and untreated ties in railway lines having heavy traffic, the recording of results in these special cases, and co-operation with railway officials to obtain data as to the "life" of ties under actual conditions. The preparation of specimens of different kinds for exhibition, in order that both technical experts and the general public may see the results of these investigations, is an important feature of the work, as well as the answering of inquiries which Canadian business men and manufacturers are making with increasing frequency. The exhibit of Canadian woods made at the Empire Timber Exhibition in London in the summer of 1920 was prepared at the Laboratories, and placed in position by one of its officers, who also wrote the report on the Exhibition which has been published as Circular No. 12 of the Forestry Branch. The need of the more economical utilization of forest products has led in the last few years to the establishment of forest products laboratories in three different countries of the Empire and similar institutions are in process of establishment in four more parts of the British Commonwealth. There is need, therefore, that Canada, the greatest forest country in the Empire, should make her Laboratories as complete and efficient as possible.

#### PETAWAWA FOREST EXPERIMENT STATION

The investigative work inaugurated on the military reservation at Petawawa, Ontario, in 1918 and 1919, was continued and extended during the season of 1920. Additional permanent sample plots were established with the object of studying yield of merchantable species, the effect of thinnings to improve and increase the final yield, the best means of securing natural reproduction, and the release of conifers from the domination of less valuable species. A considerable amount of work has been done on the study of European mensuration methods, their adaptation to scientific work in this country and their practical use at the present time. It has been possible already to secure valuable results in this line of work.



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In the course of an experiment, established with a view to assisting coniferous growth by the removal of other species, it was found possible to dispose of the material cut. Authority was obtained from the Department of Militia and Defence to sell the cut on a small area. This material was sold to local residents on the stump, under suitable brush disposal and other regulations, which were carried out satisfactorily, and the sale, while very small, illustrated the practicability of carrying out silvicultural experiments on a commercial basis. Experiments of this nature are to be extended and authority has been secured to cut two hundred acres. It is expected that the condition of the forest will be very much improved, by increased growth of the small conifers left, and that the sale will yield a satisfactory monetary return.

In addition to the above, a start has been made in the study of the reproduction that follows logging on pine lands. Permanent sample plots have been established on a logging operation in northern Ontario, and these plots will be examined periodically. Important results have already been obtained from these investigations and data thus secured will be of increasing value to forest engineers and lumbermen as the experiments continue.

## THE EMPIRE AND FORESTRY

The interest which the leaders of public thought in the United Kingdom are taking in the question of forest conservation has been made clear in the past year. One of the chief evidences was the holding of the Empire Forestry Conference in London in the summer of 1920. This was attended by representatives from all the Dominions and Colonies, Canada being fully represented. The conference stressed the need of having a stock-taking of all the forest resources of the Empire carried out as soon as possible, and of immediately putting into execution plans for the protection of these forests from fire, insects, and wasteful exploitation methods. It was shown that the Empire possesses woods of all kinds but that the chief source of supply within the Empire for coniferous structural timbers is, and always must be, Canada. The important place as regards timber supply, assigned to Canada by statesmen of the Empire at this conference, was further evidenced by the passage of a resolution suggesting to the conference executive the desirability of holding the next meeting in Canada, in 1923, if arrangements to that end could be made. Throughout the conference the point was repeatedly emphasized that Canada should take prompt and vigorous measures for the conservation of forest resources both for her own sake and to meet the needs of the Empire.

The conference was held at the same time as the Empire Timber Exhibition, at which Canada was represented by a display of woods and forest products prepared by the Forest Products Laboratories of this branch. This has been fully described in Forestry Branch Circular No. 12, "The Empire Timber Exhibition," which has been widely distributed and of which copies may still be had upon application.

Another evidence of the interest in forestry in Great Britain and the looking to Canada for co-operation in this matter has been the request of the British Forestry Commission to this branch for tree seed for reforesting denuded timber lands in the United Kingdom, the Forestry Commission bearing the cost of the work. The Forestry Branch has made an energetic and sympathetic response to this request, but the year 1920 was a bad year for tree seed all over Western Canada, and especially on the Pacific coast, and the result was that but little seed could be obtained. It is hoped that conditions will permit of a heavy shipment of seed in the coming year.

## STAFF AND APPROPRIATION

The strength of the inside and outside permanent staff remained practically the same as in the previous fiscal year, namely 253, and the appropriation for carrying on the work was \$862,000 as against \$850,000 in 1919-20. The details of the above will be found at the end of this part of the report.



## PUBLICATIONS AND PUBLICITY

The past year was a busy one in regard to publications and publicity. The most important document issued was the manual "Methods of Communication Adapted to Forest Protection" which deals with the construction and use of telephones, semaphores, heliographs, etc., in the forest. Bulletin No. 1, "Tree-Planting on the Prairies," was printed for the eighth time. The total number issued has now reached 60,000. The demand for information about tree planting necessitated a new and enlarged edition of Bulletin No. 69, "Care of the Woodlot." Bulletin No. 70, "Forest Fires in Canada, 1918," deals with the greatest menace to the forest. Several documents were printed for the Empire Forestry Convention in London in July, 1920, the one available for distribution in Canada being Circular No. 12, "The Empire Timber Exhibition." Fire prevention notices, one of the most effective means of keeping down fires in the forests, are now standardized as to size and material, but the mottoes, messages, and warnings are completely changed each year and made as striking as possible. The use of automobiles by those going into the reserves, and of airplanes to protect the forests, necessitated the designing of "stickers" to be attached to the wind-shields of the former and of slips to be dropped upon camps by the flying men. Another method of publicity adopted in the past year, by arrangement with the Post Office Department, was the placing of the words "Help Prevent Forest Fires" on the cancelling stamps of several western post offices. An important feature of the work has been the supplying of information to the newspapers of Canada, which, more than ever before, have in the past year impressed upon their readers the importance of forests to Canada and urged all to assist in preventing their destruction by fire.

## LIBRARY

During the year, the library has had the opportunity of extending its usefulness to quite a degree through co-operation in the research work done by a party of the branch, from which many calls were received. The party in the field as it progressed in its investigations was kept in touch with the latest results obtained in similar work in other countries. Special mention might be made of the usefulness of certain Swedish literature in this connection. A special study of tables of volume, growth, and yield was made from which lists are being prepared and sent out, from time to time, to field officers and others interested.

In January the library was moved to more suitable and somewhat larger quarters. During the year 528 books and pamphlets have been added to the library. A total of 111 periodicals has been regularly received, 52 by subscription, and 59 by exchange or other arrangements. About six hundred photographic negatives have been added to the collection. The total number of pictures is now about 12,300.

## STATISTICS

A report on the extent, character, ownership, management, products, and probable future of the forests of Canada was prepared for presentation to the delegates at the British Empire Forestry Conference in London in July, 1920. The co-operative arrangement between this Branch and the Dominion Bureau of Statistics for the publication of forest products statistics was continued. Bulletins were issued for distribution covering the annual production of lumber, lath, shingles, pulpwood, pulp, and paper under this arrangement. Studies of the wood-using industries of Canada, similar to those undertaken from 1911 to 1916, were resumed in co-operation with the Bureau of Statistics. The industries in Ontario were circularized, and the information so obtained, supplemented by that secured by personal visits to characteristic establishments, will be issued in bulletin form. The other provinces will be taken up in turn, so that each province or group of provinces will be re-visited about once every five years.



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## STAFF

The total permanent staff of the Forestry Branch for the last year was as follows:—

Head office.. . . . .	39
District inspectors.. . . . .	5
Assistant district inspectors.. . . . .	2
Forest supervisors.. . . . .	17
Foresters and forestry assistants.. . . . .	13
Forest rangers.. . . . .	100
Chief fire rangers.. . . . .	8
Promoters of tree planting.. . . . .	8
Forest Products Laboratories, technical staff.. . . . .	19
Outside clerical staff.. . . . .	42
	<hr/>
	253

## APPROPRIATIONS

The appropriation for the fiscal year was \$862,000, plus refunds from fire guarding and vote covering payments of back salary under classification, \$83,214.08; total available for expenditure \$945,214.08. The expenditure was divided as follows:—

Salaries at head office.. . . . .	\$ 24,462 59
Travelling expenses.. . . . .	2,518 55
Printing and stationery.. . . . .	2,746 09
Miscellaneous expenses.. . . . .	5,069 36
Statistics.. . . . .	4,105 00
Fire-ranging.. . . . .	281,896 53
Forest reserves.. . . . .	467,406 64
Surveys.. . . . .	8,912 93
Tree planting.. . . . .	71,544 81
Forest Products Laboratories.. . . . .	70,974 84
	<hr/>
	\$939,637 34

The field expenditure, exclusive of tree planting on prairie farms, is divided as follows among the provinces:—

Manitoba.. . . . .	\$129,508 26
Saskatchewan.. . . . .	204,883 49
Alberta.. . . . .	226,459 35
British Columbia (Railway Belt).. . . . .	197,365 00
	<hr/>
	\$758,216 10



TABLE 1—STATEMENT OF REVENUE, FORESTRY BRANCH, FISCAL YEAR ENDED MARCH 31, 1921

Reserve	Timber sales	Timber fees and dues	Timber seizures	Grazing permit and trespass dues	Hay permits and seizures	Surface rentals	Special uses	Nursery stock	Unclasi- fied	Total
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Turtle Mountain.....		456 11	12 00	2,577 95	621 75	71 60	29 00			3,768 41
Spruce Woods.....		16 25		1,021 25	156 75					1,194 25
Riding Mountain.....		10,557 63	838 60	1,249 15	1,132 75	198 00	779 00			14,755 13
Duck Mountain.....		6,134 42	96 00	499 55	622 50	205 00	129 00		75 00	7,761 47
Moose Mountain.....		415 35	5 00	901 20	1,111 25	95 00	888 30		175 00	3,591 10
Beaver Hills.....		57 25	8 00	1,078 99	830 25		13 00			1,987 49
Porcupine.....	5,258 88	1,769 55	76 10	199 95	631 45		111 25			8,047 18
Pasquia.....	9,686 93	5,216 21	286 56	22 30	305 25		183 00			15,700 25
Port à la Corne.....	200 00	614 23	87 10	115 40	17 75		100 00			1,134 48
Pines.....		1,735 40	13 25	616 15	108 50		31 00			2,504 30
Nisbet.....		1,969 65	10 90	101 42	161 75		30 25			2,513 47
Big River.....	239 50	236 85		239 40	432 50		9 00		50 00	967 75
Steep Creek.....		20 00		120 25						140 25
Sturgeon.....		91 39		251 77	131 00		17 00			491 16
Keppel.....		225 85	2 50	739 10	17 00		10 00			994 45
Manito.....		167 40	7 00	2,782 53	73 75		38 50			3,069 18
Dundurn.....		22 25		615 57	86 00		10 00			733 82
Seward.....				669 99	60 25		19 00			749 24
Elbow.....		0 50		1,204 40	66 25		20 00		187 00	1,478 15
Big Stick.....				8,641 44			53 00		35 00	8,729 44
Cypress Hills.....		913 15		6,311 62		55 00	2 00			7,281 77
Cooking Lake.....		160 00		491 09	360 75		28 50			1,040 34
Crowsnest.....	571 18	2,833 19	21 00	7,247 88	19 25	110 84	394 00		1,500 00	12,697 34
Bow River.....		1,910 72		6,421 97	90 75		71 35			8,494 79
Clearwater.....	5,483 22	477 00	416 16	342 66	14 50	440 32	172 25			7,346 11
Brazeau.....	5,023 79	2,946 53	51 60	55 65	1 85	534 78	272 00			8,856 20
Athabaska.....	2,082 78	1 50		56 80	8 00		24 00			2,173 08
Lesser Slave.....	7,908 96	0 50		10 05	30 50		6 00			7,956 01
British Columbia Reserves.....	2,239 99	89 88	218 30	5 15	111 25	144 00	107 71		2,990 43	5,906 71
Indian Head.....								1,246 50	472 19	1,718 69
Total.....	38,695 23	39,038 76	2,150 07	44,590 63	7,203 55	1,854 54	3,548 11	1,246 50	5,484 62	143,812 01



TABLE 2—STATEMENT OF TIMBER PERMITS ISSUED IN FOREST RESERVES, FISCAL YEAR ENDED MARCH 31, 1921

Reserve	No. of permits		Kinds and Quantities of Timber Authorized to be Cut										Dues and fees \$ cts.
	Free	Paid	Poles or rails	Fence posts	Saw timber Ft. B.M.	Railway cross-ties	Mine timber Lin. Ft.	Building logs Lin. Ft.	Fuel green	Fuel dry			
									Cords	Cords			
Turtle Mountain.	69	95	...	6,630	190,510	...	...	...	8,077	...	2,257	456 11	
Spruce Woods.....	27	2	250	...	...	...	...	...	...	...	445	16 25	
Riding Mountain.....	285	918	...	37,458	4,085,675	...	...	...	34,570	299	5,731	10,557 63	
Duck Mountain.....	248	382	2,000	31,414	2,161,233	...	...	...	26,089	5	6,045	6,134 42	
Moose Mountain.	7	121	50	15,375	3,000	...	...	...	2,670	245	482	415 35	
Beaver Hills.....	150	13	...	1,150	1,660	...	...	...	850	3	2,143	57 25	
Porcupine.....	36	87	750	2,300	715,556	...	...	...	6,370	...	595	1,769 55	
Pasquia .....	38	132	12,400	165,735	97,250	930	...	...	65,286	90	11,741	5,216 21	
Fort à la Corne..	104	74	5,837	6,470	190,281	...	...	...	7,370	...	1,623	614 23	
Pines.....	78	141	7,800	18,848	124,716	4,600	...	...	24,676	135	4,676	1,735 40	
Nisbet.....	139	152	14,650	18,276	5,800	5,700	...	...	25,200	25	6,970	1,969 65	
Big River .....	14	14	3,850	3,900	2,600	...	...	...	13,838	...	831	236 85	
Steep Creek.....	5	3	400	2,000	...	...	...	...	3,000	40	40	20 00	
Sturgeon.....	12	6	3,100	3,260	20,000	...	...	...	6,443	...	80	91 39	
Keppel .....	8	86	60	450	...	...	...	...	500	40	378	225 85	
Manito .....	88	64	2,640	8,785	...	...	...	...	1,540	142	830	167 40	
Dundurn.....	...	15	...	...	...	...	...	...	...	74	10	22 25	
Elbow.....	...	...	...	...	...	...	...	...	...	...	...	0 50	
Cypress Hills.....	164	328	47,215	49,975	3,800	...	...	...	41,410	728	2,095	913 15	
Cooking Lake.....	50	18	4,000	2,500	...	...	...	...	21,800	...	1,308	160 00	
Crowsnest .....	85	112	8,102	8,713	133,518	...	903,500	...	86,694	14	1,711	2,833 19	
Bow River .....	36	53	3,875	5,050	362,070	2,000	...	...	64,259	...	520	1,910 72	
Clearwater .....	29	15	100	...	3,000	...	5,000	...	58,000	...	829	477 00	
Brazee .....	13	25	500	...	...	...	451,931	...	154,800	...	278	2,946 53	
Athabaska .....	6	...	500	...	...	...	...	...	2,000	...	100	1 50	
Lesser Slave .....	2	...	...	1,000	...	...	...	...	...	...	...	0 50	
British Columbia Reserves	22	17	430	619	702,500	...	...	...	9,997	...	290	89 88	
Total .....	1,718	2,873	118,509	389,908	8,803,469	13,230	1,360,431	665,439	1,800	...	52,008	39,038 76	



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TABLE 3—STATEMENT OF GRAZING PERMITS ISSUED IN FOREST RESERVES,  
FISCAL YEAR ENDED MARCH 31, 1921

Reserve	No. of permits	Number of Stock				Dues and fees collected
		Cattle	Horses	Sheep	Total	
Turtle Mountain.....	124	1,956	224		2,180	\$ cts. 2,577 95
Spruce Woods.....	47	558	121		679	1,021 25
Riding Mountain.....	74	2,636	100		2,736	1,167 15
Duck Mountain.....	21	851	34	64	949	473 92
Moose Mountain.....	80	1,882	237		2,119	901 20
Beaver Hills.....	84	2,097	171		2,268	1,078 99
Porcupine.....	15	719	41	7	767	199 95
Pasquia.....	4	59	17		76	22 30
Fort à la Corne.....	9	413			413	115 40
Pines.....	45	1,927	232		2,159	616 15
Nisbet.....	14	236	36		272	101 42
Big River.....	7	773	68		841	239 40
Steep Creek.....	1	300			300	120 25
Sturgeon.....	9	502	22		524	251 77
Keppel.....	53	1,222	425		1,647	739 10
Manito.....	120	4,174	964	60	5,198	2,689 51
Dundurn.....	37	1,095	284		1,379	615 57
Seward.....	22	347	309		656	669 99
Elbow.....	98	2,007	644	450	3,101	1,204 40
Big Stick.....	287	8,605	3,643	9,030	21,278	8,544 44
Cypress Hills.....	166	6,178	3,421		9,599	6,197 78
Cooking Lake.....	32	1,180	75		1,255	457 09
Crowsnest.....	199	10,592	3,240	2,150	15,982	7,183 56
Bow River.....	147	9,205	3,680	706	13,591	6,348 97
Clearwater.....	47	372	170		542	342 66
Brazeau.....	2		87		87	55 65
Athabaska.....	10		85		85	56 80
Lesser Slave.....	1	22	2		24	10 05
British Columbia Reserves.....	2	3	14		17	5 15
Total.....	1,757	59,911	18,346	12,467	90,724	44,007 82

TABLE 4—STATEMENT OF TIMBER CUT ON FOREST RESERVES UNDER AUTHORITY  
OF TIMBER SALES, FISCAL YEAR ENDED MARCH 31, 1921

Reserve	Previous sales still operating	Sales made current year	Saw-timber	Mine Timber				Rail-way cross-ties	Dues collected
				Props	Props	Lagging	Lagging		
			Ft. B.M.	Ft. B.M.	Lin. ft.	Cords	Ft. B.M.	No.	\$ cts.
Porcupine.....	1	4	551,137						2,561 86
Pasquia.....	3	6	3,462,431						7,402 73
Fort à la Corne..	1	1	86,801						149 32
Nisbet.....		1				209			159 50
Crowsnest.....	2	1	1,071,137						571 18
Clearwater.....	1	2	492,922	2,934,096	44,850	724			5,162 47
Brazeau.....	3	1	328,304	302,078	227,492	241,868	957,472	36,108	5,023 79
Athabaska.....	1		584,109						1,527 78
Lesser Slave.....	1	3	3,821,910						5,658 96
British Columbia Reserves.....	3	4	76,519					7,025	899 45
Total.....	16	23	10,475,261	3,236,174	272,342	242,801	957,472	43,133	29,117 04



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TABLE 5—STATEMENT SHOWING QUANTITY OF TIMBER SOLD AND REVENUE DUE, FISCAL YEAR ENDED MARCH 31, 1921, ON LICENSED TIMBER BERTHS WITHIN DOMINION FOREST RESERVES

## MANITOBA

Reserve	Timber berths	Area in reserve	Quantity sold			Revenue		
			Lumber	Lath	Other* products	Dues payable	Rent payable	Total payable
	No.	Sq. Mls.	Ft. B.M.	No.		\$ cts.	\$ cts.	\$ cts.
Riding Mountain..	4	42.43	521,087	.....	1,067	422 81	222 15	644 96
Duck Mountain....	11	99.76	892,082	157,650	2,133	541 36	499 90	1,041 26
Total.....	15	142.19	1,413,169	157,650	.....	964 17	722 05	1,686 22

## SASKATCHEWAN

Porcupine .....	40	868.37	27,191,616	2,463,400	1,711,283	21,228 10	3,994 05	25,222 15
Big River.....	12	253.75	36,109,037	10,040,106	196	25,534 53	1,268 75	26,803 28
Nisbet and Pines ..	4	80.69	.....	909,800	15,073	3,577 66	173 15	3,750 81
Total .....	56	1,202.81	63,300,653	13,413,306	.....	50,340 29	5,435 95	55,776 24

## ALBERTA

Crowsnest.....	11	254.94	.....	965,417	980,868	5,872 38	1,374 70	7,247 08
Bow River.....	14	227.90	3,572,085	.....	10,514	1,910 63	1,825 60	3,736 23
Clearwater.....	4	371.52	.....	.....	318,592	11,761 93	1,887 80	13,649 73
Brazeau.....	11	163.85	1,001,614	.....	311,054	12,842 31	1,131 30	13,973 61
Total.....	40	1,018.21	4,573,699	965,417	.....	32,387 25	6,219 40	38,606 65

## BRITISH COLUMBIA

Total.....	11	133.57	13,151,401	.....	31,348	11,177 36	667 85	11,845 21
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## GRAND TOTAL

Grand total.....	122	2,496.78	82,438,922	14,536,373	.....	94,869 07	13,045 25	107,914 32
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\* The figures in this column indicate the number of units on which the dues were calculated. They include 1,003,755 fence-posts, 6,239 cords of wood, 2,324,053 railway cross-ties, 7,410 logs, 38,365 lineal feet of piling, and 2,306 rails.



## APPENDIX No. 1

## REPORT OF THE CHIEF OF THE TREE-PLANTING DIVISION

NORMAN M. ROSS

The season of 1920 was on the whole very much more favourable than that of 1919. Generally speaking, all plantations set out this year have done as well as in any previous season, with the exception of those in certain localized districts where precipitation was very light. The inspectors generally report the 1920 plantations as very good, those set out in 1919 as poor, on account of the exceptionally unfavourable conditions prevailing during that season; and that plantings of 1918 and those established previous to that date showed a better growth than for the past three years.

An increased interest in tree planting is reported by all inspectors. On the whole, applicants are preparing their ground better and those who already have planted trees are generally giving them better care and attention than in the past. There is a more general tendency to improve the home surroundings by seeding down lawns, planting shrubs and flowers, and cultivating fruits.

The increasing injury caused by soil-drifting in many districts has led to much discussion in the press, at farmers' meetings, and in private conversation as to the possibility of lessening the enormous damage by some systematic scheme of tree planting on a large scale. Many individual farmers are considering a system of wind-breaks to protect their grain fields and a few at least are definitely planning such planting for this spring.

In the south central portion of Saskatchewan the Russian thistle has spread to an alarming extent, and from the nature of the plant is a very great hindrance to the tree planter. When matured, this weed is about three feet in diameter. It breaks off at the ground and is then blown about over the prairie till stopped by some obstruction such as a fence or shelter-belt. In the badly infested districts these weeds blow into and pile up in the tree-belts as high as the tops of the trees, and in many cases make it practically impossible to cultivate or do anything with the belts at all.

No general injury has been reported during the past season from insect attacks or winter-killing. Scotch pine and some other evergreens for some unaccountable reason were badly "burned" and in some cases killed outright, due to the very severe winter conditions. It seems difficult to understand just what combination of conditions caused this injury, as in the same localities fruits and other half-hardy plants came through without injury. The trouble was apparent only with the evergreens (conifers) and was general over the whole of the Prairie Provinces, the Northwestern States and well into Pennsylvania. I am glad to report, however, that only a very small percentage of the pines were actually killed, and quite probably similar conditions may not appear again. Planters who have had more than thirty years' experience in growing Scotch pine have never before seen a similar occurrence.

## NURSERY WORK

At Indian Head the season on the whole was fairly favourable for the growing of broad-leaved stock and the stands and growths of maple, ash, and caragana seedlings were quite good. The coniferous species, however, suffered severely in the newly set out transplant plots and in the seed-beds. Dry, hot weather and high winds at planting time and for the next few weeks played havoc with the young transplants and in the seed-beds the plants came up well but were literally burned up by the hot



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sun and dry weather in June. Unfortunately the water supply was extremely short and it was not possible to save the beds by artificial watering. I estimate that probably 40 per cent of the seedlings were lost in this way.

*Distribution.*—Shipping of broad-leaved stock commenced March 8 and was completed May 18. Evergreens were shipped out May 21 and shipping completed May 29.

## DISTRIBUTION OF BROAD-LEAVED STOCK IN 1920

Number of applicants receiving trees.. . . .	4,201
Seedlings and cuttings distributed.. . . .	3,250,000
Average number per applicant.. . . .	773
Number of applicants on inspection list, 1920.. . . .	7,816
Number of new applications for 1921 inspection list, approximately..	1,800

The following broad-leaved material is available for distribution this spring (1921) from the Indian Head and Saskatoon Nursery Stations: Manitoba maple, 2,446,000; green ash, 669,500; Russian poplar, 1,404,500; red willow, 1,166,000; acute leaf willow, 285,000; laurel willow, 155,500; caragana, 337,500; total, 6,464,000.

Although weather conditions in the Saskatoon district were more unfavourable from an agricultural standpoint than the average for the province I am glad to say that a considerably better growth of stocks was obtained on the Saskatoon Nursery Station, very largely due to the increased shelter afforded by the greater development of the hedges and shelter-belts.

The number of applicants on our inspection list for 1921 will be just about the same as for last season, namely approximately 8,000. It is not possible to complete these lists at this early date. There is generally much more interest being shown at the present time than in former years in the matter of tree planting, as indicated by correspondence and also by the frequency with which this question is being discussed in the western press.

Conditions in the agricultural districts still continue to be very uncertain, labour is scarce, wages high and prices for farm produce have taken an enormous drop in recent months. Consequently very large numbers of farmers who are anxious to plant are at present unable to do so on account of lack of help or shortage of funds. As soon as more normal and settled conditions again arrive, every indication points to an increased demand for tree-planting material, especially in Saskatchewan and Alberta.

*Conifers.*—Applicants numbering 641 were supplied with coniferous transplants at the nominal rate charged per 100, as follows: White spruce, 79,700; jack pine, 16,750; Scotch pine, 64,150; a total of 160,600. For planting on the forest reserves we also shipped 77,400 seedlings and transplants, making a total of 238,000 shipped out.

*Collection of seed.*—Some difficulty was experienced in securing seed this year. The season was not, apparently, a good one for maturing seed. Ash seed was not available anywhere. We were able to secure only 1,420 pounds of maple seed, partly collected in the Qu'Appelle valley, north of Indian Head, and partly in the Treherne district in Manitoba. Cones of spruce and pine were collected in small quantities on the northern reserves in Saskatchewan and Manitoba and shipped here for extraction. One hundred and twenty-eight bushels of white spruce cones yielded 109½ pounds of seed; 105 bushels of jack pine cones yielded 41½ pounds, and 41½ bushels of lodge-pole pine cones yielded 15½ pounds of clean seed.

We were also able to secure through the Forestry Commission, Scotland, ten pounds of Scotch pine seed collected in Invernesshire, Scotland. This is supposed to be one of the hardiest strains of this species. Most of the Scotch pine at present cultivated in this country originated from seed collected in central Europe. It was particularly trees of this central European strain that suffered during the past winter.



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*Distribution of Seed.*—About fifty pounds each of maple, ash, and caragana seed were sent out in small lots in March, 1921, to 106 applicants. Seventy-seven pounds of spruce and jack pine seed were supplied to the various reserves for starting seed-beds and for experimental sowings.

*Permanent Plantations.*—No new planting on the Nursery was undertaken during the past season, but some pruning of dead branches in the older coniferous plantations was done, not with the idea of improving the stand, but to make it easier to get among the trees when securing the annual growth measurements. As an indication of the growth under prairie conditions where trees are spaced approximately 4 by 4 feet the following measurements secured last season are very interesting:—

*Plot No. 1.*—Native tamarack planted in 1904; present average height, 24½ ft.; maximum height, 29 ft. 9 in.; average diameter, 3½ in.; maximum diameter 4½ in.

*Plot No. 5.*—Scotch pine planted in 1906; present average height, 19 ft. 9 in.; maximum height, 22 ft. 10 in.; average diameter, 3¼ in.; maximum diameter, 5 in.

*Plot No. 7.*—Cottonwood and maple in alternate rows, planted in 1906. Average height, cottonwood, 30 ft. 9 in.; maple, 20 ft. 2 in. Maximum height, cottonwood, 36 ft. 6 in.; maple, 28 ft. Average diameter, cottonwood, 4½ in.; maple, 2¾ in. Maximum diameter, cottonwood, 6¼ in.; maple, 4½ in.

*Plot No. 8.*—White birch and maple in alternate rows, planted in 1906; birch, average height, 23 ft. 2 in.; maximum height, 29 ft. 6 in.; average diameter, 3¼ in.; maximum diameter, 4½ in.

In view of the prevailing idea that conifers (evergreens) are so much slower growing than the broad-leaved kinds, it is interesting to notice that the maples in Plot 7 on the average show only about 5 in. more height-growth than the Scotch pine in Plot No. 5 and average three-quarters of an inch less in diameter. It is safe to say that the pines in Plot 5 would yield at the present time considerably more wood material than the maples in Plot 7, planted at the same time and under exactly the same conditions of soil and spacing. No thinning has yet been done in these plantations. The Scotch pines planted in Plot 10 in a heavy sod of rye grass in the spring of 1919 have come along splendidly and show an excellent growth under conditions that would have choked out any of the broad-leaved seedlings.

#### PLANTING IN RESERVES

In *Spruce Woods* reserve ten acres were planted with 30,000 two-year-old and three-year-old Scotch pine seedlings. Another small plot was set out with 525 white spruce transplants, as an experiment under a twenty-year stand of scrub poplar. Over 480 of these were living on September 30. The broadcast-seeding experiments were continued. An additional block of twenty acres was burned off and disked up, and sown on May 28 with a mixture of 21 pounds of jack pine seed and 34 pounds of white spruce seed. When examined on September 30 a large number of jack pine seedlings were found, and the stand estimated at about 2,000 per acre. No spruce seedlings were observed, but it would be almost impossible to find these as they would be practically indistinguishable at that age from the grass around them. Towards the end of June two pounds of spruce seed were sown in a blow-hole, where ground cedar had become established. No seedlings were found here in the fall. On November 18 two pounds of spruce seed were sown among scrub poplar and willow, the surface growth of grass being first burned off.



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- In *Cooking Lake* reserve 675 white spruce and 675 Scotch pine transplants were set out, adding to the planting of last season.
- In *Cypress Hills* reserve 2,025 white spruce and 2,025 Scotch pine seedlings were planted in the neighbourhood of the ranger station.
- In *Duck Mountain* reserve, 2,225 white spruce transplants, 2,225 jack pine transplants, 750 white spruce seedlings, and 750 jack pine seedlings were set out in several small plots for experimental purposes. Adjoining the Grand View ranger station, seven plots ( $\frac{1}{4}$  acre and  $\frac{1}{2}$  acre area) were seeded with jack pine and white spruce, under various conditions of ground cover and preparation of seed-bed.
- In *Dundurn* reserve, 9,000 spruce and 4,000 jack pine seedlings were used, principally in filling blanks in previous plantings.
- In *Elbow* reserve 15,000 seedlings each of spruce, Scotch pine, and jack pine were used for filling blanks.
- In *Nisbet* reserve 5,400 Scotch pine transplants and 2,700 jack pine transplants were planted, principally for experimental purposes.
- In *Riding Mountain* reserve 3,000 spruce, 750 Scotch pine, and 3,700 jack pine transplants were set out in several different small plots, some under poplar stands, some on open prairie. Different methods of planting and preparing the ground were employed, the purpose of these plots being purely experimental. Experiments were also started with direct seeding in spots and furrows and also broadcast. In the fall several more sample plots were broadcasted after burning off the ground cover.
- In *Turtle Mountain* reserve 3,000 white spruce transplants were planted in four  $\frac{1}{4}$ -acre plots close to what is known as the Boissevain trail. Some were set in furrows and others directly in the sod. In November, 1920, one  $\frac{1}{4}$ -acre plot on a heavily burned area was sown with white spruce broadcasted.

## VIDAL'S POINT

Forty-three permits, as compared with thirty-four in 1919, were issued for camping on the Government property known as Vidal's point, which is situated on the Qu'Appelle lakes. The public generally also made very considerable use of the portion reserved for general recreation, bathing and picnics.

## APPENDIX No. 2

## REPORT OF THE DISTRICT FOREST INSPECTOR FOR MANITOBA

## F. K. HERCHMER

I am pleased to report that the people of Manitoba are evidencing an active interest in the forest resources of the province, and that we are yearly meeting with more hearty co-operation. The public realize more keenly than ever the immense importance that forests play in our economic and national life. It is no longer necessary to point out to them the necessity of using non-agricultural land for the production of timber, and the high prices of lumber and newsprint paper, added to the increased cost of transportation, have brought home to them the advantage of an ample local supply.



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## IMPROVEMENTS

Owing to the high cost of labour and other conditions during the summer of 1920, only necessary repair work, such as could be done by our own rangers, was undertaken. About three miles of new telephone line were completed in the Turtle Mountain forest reserve. Roads were repaired in all reserves and fireguards reploughed in the Spruce Woods and Turtle Mountain forest reserves.

## SILVICULTURE

Owing to the sudden heavy drop in the price of grain and the resultant financial stringency, the settlers in the vicinity of forest reserves did very little building on their farms, the result being a distinct falling off in the number of permits issued on forest reserves. This lessening of the amount cut, however, permitted the more careful regulation of the cutting and brush-burning operations, and it was very gratifying to see that the operators themselves realized the advantage of brush disposal and cheerfully carried out the regulations in this respect. The cost of brush disposal, under the method of burning employed in this district, is less than one dollar per thousand feet board measure, and this burning not only reduces the insect and fire-hazard, but also leaves the forest floor in good condition for natural regeneration.

Several sample plots for the study of growth, etc., were laid out, marked, and recorded in the Riding Mountain forest reserve, and annual measurements will be taken.

## REFORESTATION, PLANTING AND SEEDING

During the spring of 1920, in addition to carrying out the regular planting programme on the Spruce Woods forest reserve, some forty experimental plots were either sown or planted on the different reserves. The object of this experimental planting is to determine the relative advantages of planting or sowing different species under varying conditions of soil, forest cover, and in different seasons of the year, that the best and most economical methods of artificial reforestation in places where natural regeneration has failed may be ascertained. Careful records are being taken, and the different plots closely watched. In addition to the valuable information collected in this way for future use, the forest rangers are being educated in this important part of their work, so that when the time comes for extensive reforestation by planting and seeding there will be a well trained staff to carry on the work.

## GRAZING

The use of the forest reserves for grazing is increasing in popularity with the settlers. Numbers of applications for the formation of stock associations under the forest reserves regulations are being received, particularly in those districts where other stock associations have been operating for a few years, proving that these associations are satisfactory to the settlers as well as to the forest officers. Owing to the decline in the price of cattle it is probable that there will be some reduction in the number of cattle grazed during the coming summer.

## RECREATIONAL USES

Summer resorts in forest reserves continue to increase in popularity. Applications for building sites are coming in, which will necessitate the surveying of additions to the present sites in the near future. Applications have also been received for the laying out of new summer resorts in other parts of the reserves. As the roads are improved both without and within the forest reserves, this use of the reserves will increase very rapidly.



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## GAME AND FISH

Owing to the accessibility of the reserves in this inspectorate and to the fact that they are entirely surrounded by settlement, game animals are being rapidly killed off and fur-bearing animals have almost disappeared. This matter has been drawn to the attention of the provincial game department, and I understand steps are being taken to afford greater protection to animals within the reserves.

Large numbers of pickerel fry from the Dominion fish hatcheries at Selkirk, Manitoba, were placed in some of the larger lakes in the Duck Mountain and Riding Mountain reserves, and it is hoped to continue this until the lakes are well stocked with these fish. At present very little fishing is being done within the reserves.

## FIRES

Climatic conditions during the summer of 1920 created the greatest continued hazard in the experience of this inspectorate. The season was a very unusual one for this province. Usually our greatest danger period is in the early spring, during the months of April, May, and June. In 1920, however, these three months were passed in safety. This is accounted for by the extremely heavy snowfall of the previous winter, very early spring rains, and the fact that grass and undergrowth became green before the ground had thoroughly dried out. From the end of June until the second week of September there was practically no rainfall, and everything became very dry, particularly in the northern part of the province. Muskegs dried up and lakes and rivers reached an extremely low level. Fires were bad over the whole province in August. Many settlers in the Lake Winnipeg and Lake Manitoba districts had buildings destroyed. Considering the long dangerous period, the loss in commercial timber was small, as, with great effort, fires were confined to, and held in the muskegs.

## APPENDIX No. 3

## REPORT OF THE DISTRICT FOREST INSPECTOR FOR SASKATCHEWAN

## C. MACFAYDEN

The work of the Forestry Branch in Saskatchewan, consists in the administration of the Dominion forest reserves within the provincial boundaries, and that portion of the Porcupine forest reserve lying in Manitoba, together with the maintenance of a fire-protection staff on those lands not yet included in any reserve but on which there is now merchantable timber or valuable young growth. The Branch is thus concerned with all lands that are likely to be maintained permanently under forest cover, whether they are now actually established as reserves or not. To the foregoing work, should also be added that arising from the enforcement of the fire-prevention requirements, laid down by the Board of Railway Commissioners of Canada for railways under the jurisdiction of that body.

The forest reserves now actually established, number fifteen, with an aggregate area of approximately 6,500,000 acres, exclusive of the proposed Big Stick forest reserve, north of Maple Creek, containing approximately 400,000 acres, which while not as yet established by Act of Parliament, is, in part, administered by the Forestry Branch. These figures are as they were a year ago, no new reserves having been established during the year, and the area of lands withdrawn from existing reserves being so small as to be negligible. Since the early part of the year applications to have lands withdrawn for agricultural purposes have grown less and less, indicating that lands suitable for this purpose within the reserves, are growing correspondingly



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scarce. In dealing with these applications, the attitude was taken that ultimately all lands should be put to their highest economic use and there was accordingly no hesitation in recommending for withdrawal lands that were upon examination, thought to be suitable for the growing of cereal crops. As stated in my last report, withdrawal was not recommended when the lands applied for were found to be suitable only for grazing purposes. In the case of these it was believed that the Forest Reserves Regulations provided for their fullest use, and their retention, if for no other reason, was by this justified. That such action will meet with public approval, is indicated in the resolutions passed at several meetings called to discuss the problems of the so-called "dry belt" of the province. In these resolutions it was urged that all lands not suitable for cultivation be retained as "community range," on which the stock of the district would be grazed on a co-operative basis.

#### FIRE PROTECTION

Unlike the preceding season that under review was, from a fire-protection standpoint, a normal one over the greater part of the district. Owing to an extremely long winter, the interval between the time when the snow disappeared and the time when the vegetation had advanced sufficiently to check fires that may have started was very much shortened, with an accompanying reduction in the fires that are usually looked for in the latter part of April and in the month of May. The advantage thus gained was, however, offset to some extent by a period of drought during parts of July and August, a period during which we are usually comparatively free from fire. The fires occurring at this time were the most serious of those during the season, and the situation was for a short time most critical, particularly in the Battleford fire-ranging district and the neighbouring reserves and districts of the Prince Albert fire-ranging district and the northeastern part of the province. The southern and central northern reserves and fire-ranging districts escaped and experienced a very favourable season on the whole. The peak of the fire-hazard, coming as it did at an unexpected time and during the harvest season, found this office handicapped for labour, although with few exceptions the situation was satisfactorily handled. The damage and fire-fighting costs were kept down, the expenditures on this account being less than one-third those of the preceding year, and the damage infinitely smaller. In order that the flow of labour from the wooded districts to the harvest fields will not again deplete the supply, it is hoped that in future improvement and fire-fighting work can be so correlated that the former will maintain such a supply of labour during the fire season that at least the nucleus of a fire-fighting crew will be available for the latter at any time. Following the dangerous period in July and August, there was sufficient rainfall to minimize the danger of fire until the first frosts and long, cool nights again came around. These, as usual, effectively checked any fires that started.

Fires set out for land-clearing purposes continue to be one of the greatest sources of forest fires, and with the increasing rural population in and adjacent to the wooded districts, this hazard is one that will no doubt continue for some years to come.

Another growing source of fires, lies in the increasing interest in prospecting for mineral, gas, and oil in the northern and northeastern parts of the province. This particularly affects the Pasquia and Porcupine reserves, and the fire-ranging districts immediately north of them. One or two fires were undoubtedly started by prospectors this season, and while it is a difficult cause to deal with, since those engaged in this work are very apt to find their way into any part of a very large territory, plans are being laid to keep as close surveillance of these as possible.

#### IMPROVEMENTS

The year saw considerable progress made in the improvement programme for the district. In any system of forest management removed from mere exploitation, it is necessary that a large capital investment be made to provide the necessary accommoda-



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tion for the staff, that every part be made accessible by wagon road or pack-trail, and a communication system established, rendering possible the rapid communication of messages arising out of administration and fire-protection matters. There is a tremendous amount of such work necessary to bring heretofore undeveloped reserves into such shape as to allow of the administration aimed at.

The planned telephone system on a number of the reserves, especially the larger ones in the north, was pushed forward during the year. On the Sturgeon forest reserve, twenty-five miles of line construction this year completed the primary system, and there is now a line around three sides of the reserve, placing the officer in charge in direct touch with each forest ranger under his supervision. The line previously constructed on the Big River forest reserve, and running from the town of Big River to the Otter Creek ranger station eight miles north, was extended westward as part of the primary system crossing the reserve from east to west and connecting the Gutches and Birch ranger stations with the reserve headquarters. This line is not yet completed, but that portion now built is of standard pole construction and one of the best in the district. When completed, it will fulfil a long-felt want in a country far removed from all commercial or rural lines, and with only an infrequent mail service. The same line was, under an agreement with the Canadian National Railways, extended south from Big River, on the railway telegraph poles, a distance of four and a half miles to the Bodmin lookout tower, from which point an observer overlooks the greater part of the Big River forest reserve and a portion of the Sturgeon reserve with the country intervening. The headquarters of the Porcupine reserve are situated near Usherville at a distance of thirty miles from the nearest railway point, and the lack of telephone communication with our officers there has been a serious drawback to the proper administration of the reserve. In order to overcome this and also to provide connections with intermediate points on the reserve a line was built to Hudson Bay Junction on the Canadian National railway. A line constructed on poplar poles some years ago, on the Beaver Hills reserve, was this year placed on cedar poles. At the same time there were built six miles of standard metallic line on cedar poles, giving connection with the rural line south of the reserve, so that the system on this reserve is now complete, and gives communication with the whole of the surrounding settlement. The headquarters of the Manito forest reserve, situated eight miles west of Yonker, were connected with the latter point by metallic line on cedar poles, and now have connection with the rural lines north and east of the reserve.

In addition to the foregoing new construction, the required maintenance work was carried out on existing lines, and several short connections built to lookout towers. While even our primary system is yet incomplete, we are rapidly reaching the stage where all of our headquarters and most of our important ranger stations are provided with telephone facilities.

Three houses were built during the year, two at Big River, providing accommodation for the senior forest ranger and clerk, and one at Fort à la Corne for the senior forest ranger at that point. A new barn was erected at headquarters of the Nisbet reserve to replace the old one destroyed by fire during the year. In addition to the foregoing, several log-cabin patrol stations were completed, and the necessary maintenance work carried on on all the older buildings.

Expenditure on new roads was limited to those following the telephone lines built on the Big River, Sturgeon, and Porcupine forest reserves, these two facilities being closely related, and the work of construction usually going hand in hand. Except in the case of that on the Big River forest reserve, it was not attempted to complete the road in all detail, but rather, after properly locating the route, to merely make it passable, leaving the remainder of the work to be carried out by the reserve staff as opportunity offered.



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No steel lookout towers were erected during the year, but several wooden towers of different designs were put up by the rangers on the better lookout points. We have been fortunate so far in placing our steel towers on what proved to be good lookout points, but the practice of first placing inexpensive wooden towers on points about which there is any doubt, before erecting a steel structure, is to be commended.

Little outlay was made on account of improvements within the fire-ranging districts, the work here being confined to that which could be accomplished by the rangers themselves. In the more northern districts, this consisted of the marking and clearing of portages and the erection of towers at frequent intervals along the waterways patrolled. Farther south, where horses are the means of transportation, old trails were opened up, and when necessary, streams and soft places bridged or corduroyed.

#### GRAZING

In spite of the unsatisfactory condition existing in the stock industry, there was, as predicted in my last report, an increase in the use of the reserves for grazing. The increase was not equal to that made in the preceding year, but yet very satisfactory in the light of the experience passed through by the stockmen the winter before, and the condition of the beef and mutton market for the greater part of the year under review. There were altogether 839 permits issued, representing in the aggregate, about 38,500 head of stock. Not more than 10 or 12 per cent of the above stock was carried on the northern reserves. In other words, about 90 per cent of the grazing is done on about 10 per cent of the total area of the reserves. It is doubtless true that a large percentage of the land of the northern reserves is unfitted for grazing, but there are sufficient grazing lands of a quality equal to the southern reserves to maintain three to five times the number of stock we now have under permit. Certain adjustments in grazing methods in these northern reserves have been made, and it is safe to assume that the utilization of the forage crops of these lands will now steadily increase.

The use of the various ranges on a co-operative basis continues to grow in favour, and where there were twenty-four stock associations last year, there are now thirty-five. With few exceptions, these are active, thriving bodies, with a tendency to enlarge on the original object of their formation. It is particularly gratifying to see the increasing interest taken in securing better breeding stock. Thus eventually, the stock in the district from which the associations membership is drawn, will be of a high quality, and limited to a single breed. This would seem to be the line along which the associations growth should be encouraged, and the propaganda now being carried on by the different provincial and federal departments, and the universities, for the eradication of scrub breeding stock is having that tendency.

Throughout the reserves, there are areas producing annually a quantity of wild hay. The Forest Reserves Regulations make provision for the issuance of permits authorizing the cutting of this, either for a settler's own stock, or for sale, although permits for the latter use are issued at a higher rate of dues, and only after the needs of those requiring it for their own stock have been satisfied. At best it is an uncertain crop, and periodically there occur years when the crop is negligible, with the result that those depending on it find themselves short of winter feed at a time when this condition is hard to rectify. During the best of years it is a precarious source of winter feed and, everything considered, it is not deemed advisable to encourage this use of the reserves, except in particularly favourable locations. With the increasing frequency with which most of such lands are being grazed, the permits to cut hay will probably gradually disappear. The year under review was, unlike the preceding year, one of an abundant hay crop in most parts, and 651 permits for this use were granted, totalling 15,300 tons. Generally, the demand, though equal to the supply, was only



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a fraction of what it was a year ago, except in the case of the Nisbet Forest Reserve, where, owing to the number of applicants, the privilege to cut each meadow was put up to tender.

## USE OF RESERVES FOR RECREATION PURPOSES

There was not the increase in the use of the different reserves as recreation grounds which had been looked for. The recreational facilities of the reserve were not taken advantage of except the regularly established resorts of the Moose Mountain reserve, and the parts of the Manito reserve designated as picnic grounds. It is possible that the general business depression and uncertainty existing throughout the year prevented people from holidaying as they would otherwise have done, but there are indications that with the return of normal conditions, the different reserves are going to be frequented by pleasure seekers much more than in the past.

The Fish Lakes resort, in the Moose Mountain reserve, continues to lead in the number of people visiting it. The ranger in charge states that at a conservative estimate, between ten and twelve thousand people visited this place during the holiday season, a very large percentage of them coming in from North Dakota and Montana, to spend the week-ends. The fishing regulations require non-residents only to take out permits, and from these visitors over \$1,000 was collected in this way, at this point alone. When there is added to this the money spent in other ways, and the publicity given, this use of the reserves appears to be one that should be encouraged, so long as it does not interfere with the objects for which the reserves were set aside. During the year, co-operation with the provincial department charged with the administration of the game laws was very much increased by that department vesting a number of Forestry Branch officers with the powers of game guardians.

## TIMBER SALES AND PERMITS

During the year's cutting season, there were sixteen timber sales in good standing. Four of these were made during the year. Only nine of those that were in good standing, were operated, although these show a cut approximating that of last year, namely, 3,500,000 feet board measure. The timber sale business has for some years past been virtually confined to the Pasquia and Porcupine reserves, the only others in which operations were carried on, the Nisbet and the Fort à la Corne, producing only a small quantity. The price received for the material sold, was on the average considerably higher than in former years.

Where any competition was expected, the sales were made by public auction instead of by tender as in the past. Except where the amount is small, and only the applicant interested, sale by auction was found to be much more satisfactory from the standpoint both of the department and of the persons contemplating purchase.

During the year the policy of last year, of endeavouring to limit, as far as possible sales to fire-killed material was continued. Sales made on the Nisbet and Fort à la Corne reserves were entirely of this class, and on the Porcupine a considerable percentage was fire-killed, although enough green material was sold to encourage the removal of the dry. Green material was also sold in every instance where it lay in comparatively small blocks adjoining lumbering operations, as if not cut with these it would probably remain until overmature, or become decayed and wind-thrown, since these blocks did not in themselves constitute a lumbering unit that would justify a separate operation. It is believed that of the fire-killed timber that we can hope to salvage, sufficient has been cut to leave only what can be taken care of by the normal demand.

During the latter part of the winter, several inquiries were received in connection with available pulpwood, and there is some indication that some of the mills are turning their eyes to northern Saskatchewan in search of this product. The export of



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this class of material in an unmanufactured state is prohibited, so that the demand at present is limited to one or two Canadian mills, but if these can utilize the black spruce so common on some of our northern reserves, it will help very much in the utilization of this material.

Timber permits issued free to homesteaders, for material for their own use, and permits for material at the prescribed rate of dues, were both in excess of those of last year. The number of permits issued was 805 free and 992 paid, a total of 1,797. A greater number would no doubt have been issued except that during the early part of the winter, there was hardly sufficient snow to permit hauling, and during the latter part it was so deep as to make hauling difficult. The very mild winter also had a tendency to disrupt the fuel-wood market, with the result that permits for this class of material were not in the same demand as was anticipated from the state of the labour market. In Prince Albert there existed a demand for railway ties, which afforded an opportunity to sell a very considerable quantity of fire-killed jack pine on the Pines, Nisbet, and Sturgeon forest reserves. In order to secure as close utilization as possible, the conditions attached to these permits stipulated that all tops must be made into cordwood, where this was practicable and the market could be found.

#### APPENDIX No. 4

### REPORT OF THE DISTRICT FOREST INSPECTOR FOR ALBERTA

C. H. MORSE

The work of the Forestry Branch in the province of Alberta falls into two main divisions: the protection and administration of the forest reserves, and the protection of timber lands not included therein. This latter work includes a special organization co-operating with the Board of Railway Commissioners of Canada for fire protection along railway lines.

#### FIRE PREVENTION AND SUPPRESSION

*Fires within Forest Reserves.*—The winter of 1919-20 was an unusually severe one with a very heavy snowfall, and as a result the spring was very backward. Except in certain especially dangerous localities, as for instance, along the Coalepur-Lovett line on the Brazeau forest, we entirely escaped the usual spring fire-hazard. Throughout the early summer showers were frequent and the growth of grass, so long delayed, became very rank. After the middle of July the rains ceased almost entirely and the weather turned very hot. By the end of July we had to face a very dangerous fire situation, for the heavy growth of grass soon dried and became very inflammable. The weather continued exceedingly dry up to October 11, when a heavy, general snowstorm occurred. A few fires were reported after that date but they were small, burning in moss, and not particularly dangerous.

A total of 106 fires was handled by the forest reserves organization during the season, of which two occurred outside the reserves. Of these, 84 were caused by railways, 8 by campers, 5 by smokers, 4 by lightning, 1 by a stationary engine, and 4 by unknown causes. On the forest reserves 12,000 acres were burned over, but fortunately the fires were kept away very well from areas bearing merchantable timber. The total quantity of timber killed and damaged was approximately ten million feet of saw-timber and twenty-two thousand cords of fuel-wood.

*Fires Outside Forest Reserves.*—Fire protection on Dominion lands outside the forest reserves is carried on in three large divisions, the Edmonton, McMurray-Slave, and Mackenzie River fire-ranging districts. The latter two districts include



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all the great river routes in northern Alberta and the region to the north of it, from Grand Rapids on the Athabaska river and Vermilion Falls on the Peace river. The timbered land south of these points not included in the forest reserves forms the Edmonton district. This latter district is under the supervision of a chief ranger who, with four sub-chiefs, directs the work of thirty-eight rangers.

Ten large fires and 228 small ones occurred in the Edmonton district, burning an area of approximately five thousand acres. Fires occurred in all months from April to December, but October was the most dangerous. Railways contributed 58 fires; campers, 57; settlers, 58; sawmills, 3. The causes of 50 of the fires could not be determined. Two convictions were secured against lumber companies for allowing fire to spread from their mills. A settler was fined for burning brush without proper precautions, and two men were fined for refusing to fight fire.

In the McMurray-Slave district twelve rangers and four assistants are employed, working under the supervision of a chief ranger whose office is at Fort McMurray. Six large fires and 22 small ones were reported in this district, burning an area of 6,000 acres. They occurred at various times from April to September, and with the exception of seven were caused by campers and travellers. No fires were reported from the Mackenzie district.

*Railway Fire-ranging.*—Supervision of the railway fire patrols was carried on as in previous years in co-operation with the Board of Railway Commissioners. This work covered the Canadian National, the Grand Trunk Pacific, the Canadian Pacific, and the Edmonton, Dunvegan, and British Columbia railways. There were 355 railway fires reported, practically all of which are believed to have been started by locomotives. This large increase over the number of railway fires of last year is attributed to the greatly increased traffic and the use of inferior coals. Of the 355 fires 260 were extinguished almost as soon as started and burned only a few square yards. The damage done by these was, of course, negligible. Of the remaining 95 fires only five spread over an area greater than fifty acres or did any serious damage. The total area burned was approximately 3,000 acres, of which less than one-third carried merchantable timber, the remainder being young growth and old brule. The merchantable timber destroyed, it is estimated, amounted to 180,000 feet board measure of saw-timber and 9,000 cords of fuel-wood. It is interesting to note that one single fire is responsible for 80 per cent of this damage.

## AIRPLANE PATROL

The summer of 1920 witnessed the first use of airplanes in forest protection work in this district. Through the co-operation of the Air Board an air station was established at Morley to carry out flights over portions of the Rocky Mountains forest reserve for the detection of fires. It was decided that the southern part of the Rocky Mountains reserve including the Crowsnest, Bow River, and part of the Clearwater forest would be the most satisfactory region to test an airplane patrol. The reason for this is that on the reserves named above there are better communication facilities than elsewhere and the best possible use of airplane reports can be made. On the Bow River and Crowsnest forests all important ranger stations are linked up with the supervisor's office by telephone and the stations are accessible by motor-car.

The location of the air station was decided upon on June 11 and the hangars were shipped immediately. Unfortunately, however, airplanes could not be provided for some time and it was not until September 7 that the first patrol was made. After this date no fires occurred on the areas patrolled, consequently I am not in a position to demonstrate the usefulness of the patrol for detecting fires. I am quite convinced, however, that airplane patrol will be a great success for this purpose during the coming summer. On the Bow River forest, on the upper Red Deer river, one fairly large fire was burning at the time the air patrols were inaugurated and the



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supervisor used the machines to make daily reconnaissances of the fire. By so doing he kept fully in touch with the operations and on his return to his office he could telephone his instructions to the ranger. By use of airplanes the reconnaissance of the fire was made in half a day. Without them it would have taken a week's trip with saddle and pack-horses. Airplanes were also used for a small amount of photographic mapping on the Bow River forest. It was found, however, that this work was left until too late in the season and that long shadows were cast by the trees, due to the low altitude of the sun, thus making confusing parallel lines on the photograph. This effect was heightened by the presence of snow on the ground.

#### IMPROVEMENTS

A combination of circumstances prevented the carrying out of our improvement plan in its entirety. In the first place the spring was very late and it was well on in June before improvement crews could work to advantage. When weather conditions became suitable the rate of wages rose so high that it was decided to reduce our improvement programme as much as possible.

A large amount of trail maintenance was found to be necessary on all reserves but very few new construction trail projects were undertaken. On the Crowsnest forest the Beaver Mines road was reconstructed in co-operation with the McLaren Lumber Company. On the Bow River forest further work was found to be necessary on the Red Deer road to make the ranger station accessible by motor-car. The Elbow bridge, which was badly damaged by a flood in 1919, was repaired and put in condition for traffic again. On the Lesser Slave reserve work was continued on the construction of a great mileage of secondary trails, in order to open up large districts of the reserve which are even yet rather inaccessible.

Two ranger houses were constructed on the Crowsnest forest. On the Clearwater one ranger house was built and materials were purchased for another. It has been decided to move the headquarters of the Brazeau forest to Coalspur. This necessitates the building of houses for the supervisor and the assistant, and also an office building. On the Athabaska forest, building construction was limited to a speeder house and one cabin, and on the Lesser Slave reserve, three small log cabins were built.

Only two telephone lines were constructed during the year, the longest being from Red Deer ranger station to the Parks ranger station at the Brewster ranch, a distance of approximately twenty-two miles. On the Cypress Hills reserve there were constructed ten miles of a line which will ultimately link up the reserve headquarters with the Birch Creek ranger station.

#### TIMBER SALES AND SILVICULTURE

During the year thirteen timber sales were in operation in the district. Nine of these sales had been running previously and one has been in operation since 1913. Four new sales were awarded during the year, three of them being for dry props for mining companies in the Clearwater and Brazeau forests and one for green timber on the Lesser Slave reserve. As in previous years the Bow River forest disposed of timber by permit only, but an application for a timber sale has now been received. The bulk of the timber permit business is confined to the Cypress Hills reserve and the Crowsnest and Bow River forests, the last named showing a remarkable increase during the year.

Considerable work was done during the summer in examining and reporting on areas of mature timber, where timber sales are proposed; for which work a party of three students was employed. One area was examined on the Bow River forest and two on the Lesser Slave reserve. A party of two students spent a short period in the Porcupine Hills district gathering data for volume tables for Douglas fir, Engel-



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main spruce, and lodgepole pine; and, while carrying out a grazing survey, another party of student assistants completed a timber reconnaissance of two and a half townships of the Crowsnest and one and a half townships of the Bow River forest. Accurate timber type maps were submitted for these areas.

Some planting was done during the year on the Cypress Hills and Cooking Lake forest reserves with transplants supplied by the Indian Head Nursery Station. On the Cypress Hills, approximately two thousand white spruce and two thousand Scotch pine were set out but were more or less of a failure, possibly owing to the fact that the plants were too far advanced in their spring growth to adjust themselves to the much higher altitude of the Cypress Hills. Somewhat better success was experienced on the Cooking Lake reserve where 1,350 transplants were set out. It has been decided that planting material should be grown in the reserve in which it is to be set out. With this in view nursery work has been continued in these two reserves. In the Cooking Lake reserves six new seed-beds were prepared and eight in the Cypress Hills. The Cypress Hills also contributed twenty bags of lodgepole pine cones for the Indian Head Nursery Station.

## GRAZING

On account of the abnormal conditions prevailing in the cattle industry there was not the usual increase in the number of stock grazing in the forest reserves of this district. The summer of 1919 was a particularly dry one and few ranchers raised sufficient feed for their stock. To make matters worse the winter was very cold and snow was deep. As a result the stockmen sold as many cattle as they could, even at a sacrifice, and there were further reductions to herds by losses on the range. In the spring many ranchers could not afford to restock at the high prices then prevailing and many who had grazed on the forest reserve for years found their own lands sufficient to pasture all their stock. This was particularly the case on the Crowsnest forest. In spite of these unfavourable circumstances there were grazed on the forest reserves 28,141 cattle, 9,225 horses, and 2,855 sheep. The Clearwater, Brazeau, and Athabaska forests, and Lesser Slave reserve are practically unutilized for grazing at present, as there are still considerable areas of open range between the settlements and the forest reserves. Even in the southern reserves there is mountain range available for large herds of sheep which goes unutilized each year. Last summer only three permits for sheep were issued. The reason for this seems to be that stockmen have not yet learned that mountain range is very desirable for sheep. Added to this is the fact that it is difficult to secure herders who have had experience in caring for sheep under such conditions.

The season of 1920 was a very favourable one for grazing. Although the spring was very late and the range was not ready for grazing as early as usual, there was an abundance of rain in the early summer, which produced a luxuriant growth of grass. The late summer was very dry and the grass cured well, thus providing for a certain amount of old feed to supplement the young growth in the spring.

The growth of stock associations, formed for the purpose of co-operating with the Forestry Branch, is indicative of the interest which stockmen take in the use of the forest range. There are now fourteen stock associations recognized by the Forestry Branch. Of these three are in the Bow River forest, three on the Crowsnest, seven on the Cypress Hills, and one on the Cooking Lake. The members of an association graze stock on the reserve as a community and pay such costs as herding, salting, and fencing by a pro rata assessment.

During the summer the policy of extending the grazing survey was continued, and the west Porcupine Hills section of the Crowsnest forest was completed. This was accomplished by a party of five forestry students working under the direction of the grazing inspector. A detailed grazing type map was compiled and data gathered by means of which can be determined the number of stock which can be allotted to the various grazing districts. A comprehensive collection of forage plants was



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made at the same time. After completing the work in the Porcupine Hills district the party moved to the North Sheep district and covered one and a half townships in a similar grazing survey.

A very satisfactory condition of grazing management exists on all ranges where our summer grazing policy has been definitely established. Stockmen generally are beginning to realize the necessity of holding over some old forage for use during the critical spring months and not allowing it to be eaten off bare in places, as is the condition where winter grazing is practised. On ranges used in the summer only, 100 per cent more stock can be pastured than where year-long grazing is carried on. This allows for a wider distribution of grazing privileges without the necessity of reducing the permits of the larger owners. Ranges so handled are not only improving but are producing better beef. This improvement is due to the better care and feeding of stock during the winter. Stockmen using the forest range are realizing the importance of improving the grade of stock, having found that it is more profitable to raise fewer animals of better quality than to run large numbers of scrub stock. One great advantage of limiting grazing to the summer period has been that the forest range can be freed of stray and unpermitted stock. A large number of grazing divisions were satisfactorily cleared of all stock at the close of the past summer season and this includes hundreds of stray and unpermitted stock, the owners of which were required to pay trespass dues. Forest Officers are unanimous in stating that the difficulties of handling a grazing administration are greatly reduced on divisions where winter grazing is prohibited, and stockmen are beginning to realize that it is in their interests as well. Many of them who never before cultivated land or provided their stock with winter feed are now growing crops to ensure safe wintering for their herds.

## APPENDIX No. 5

### REPORT OF THE DISTRICT FOREST INSPECTOR FOR BRITISH COLUMBIA

D. ROY CAMERON

The British Columbia inspection district embraces the Dominion forest reserves in British Columbia and the Coast, Salmon Arm, and Revelstoke fire-ranging districts, all situated within the Railway Belt of British Columbia.

#### FIRE PREVENTION AND SUPPRESSION

The fire season of 1920 surpassed in hazard, intensity, and expenditure the season of 1919, which in turn was more difficult to handle than any other season encountered until that time. The season of 1920 differed from the season of 1919 by reason of the fact that the trouble was restricted to the country lying east of the Cascade range. The dangerous season in the Coast district was very short, owing to abnormal precipitation and high water during the early part of the season, and to the fact that the fall rains began early in August. Also, September, normally a bad month in the Coast district, developed, in 1920, heavy and continuous precipitation.

In the interior the fire season started propitiously, due to the slow, backward spring and normal precipitation. With the advent of July, however, conditions rapidly changed for the worse. Dry, hot weather set in, accompanied by unusually prevalent winds and a series of electrical storms devoid of precipitation. These storms occurred on July 19, July 29, and August 10. Fires started by lightning developed throughout the entire region from the vicinity of Lytton to the Alberta



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boundary. They were worst, however, in the region of the Shuswap lake and in the Eagle pass. Of all fires occurring during the season, 39.1 per cent were caused by lightning, this being by far the highest percentage attributed to this cause since the inauguration of forest administration in this district.

The total number of fires reported from all sources as occurring in the Railway Belt was 422, as compared to 408 in 1919 and 285 in 1918, which later was in many respects a normal year. The proportion of large fires—that is, fires burning over ten acres—was again abnormal, amounting to 50.7 per cent of the total, as against 52.9 per cent in 1919. On the other hand, increased efficiency of the control organizations was seen in the fact that the number of fires caused by human agency decreased from 370 in 1919 to 267 in 1920.

Of the causes of fires reported during 1920, lightning assumed first place, as mentioned above. Railway fires again were in the second place with a percentage of 14.6, as against 19.3 in 1919. For the first time yet reported, fires of unknown origin dropped to third place with a percentage of 13.9, as against 19.6 in 1919. Fires started by settlers clearing land showed the biggest reduction, dropping from 13.4 per cent in 1919 to 8 per cent in 1920. This fact, together with the correlated reduction in fires attributed to campers, which dropped from 15.7 per cent in 1919 to 5.6 per cent in 1920, indicates a very considerable tightening up in the control organization. Indeed, apart from the unfortunate occurrence of fires beyond human control, the results of the season were very satisfactory, notwithstanding a fire-hazard unparalleled in the history of forest protection in this district.

The 422 fires burned over 64,336 acres, destroyed or damaged approximately 148,000,000 feet of timber and over 18,500 acres of young growth.

*Fires within Forest Reserves.*—Thirty-one fires were reported within forest reserves during the season of 1920, twenty large and eleven small. The leading causes of these in percentages of the whole were as follows: lightning, 58 per cent; travellers, 20 per cent; hunters and campers, 7 per cent. The percentage of fires of unknown origin dropped to 3.5 per cent, a very satisfactory record. These figures show that human carelessness is still a serious factor. No fires were reported as having been deliberately set, an unusual experience when compared with the record of previous years.

The lookout stations again demonstrated their worth and the establishment of an additional lookout station at Tuktakamin mountain greatly increased detection efficiency. These lookout stations, more than any other feature of the protection organization, assist in safeguarding the forest resources of the Dominion forest reserves. It is considered that the present area under forest reserves can be completely served, as far as the detection of fires is concerned, by the establishment of three additional lookout stations, on Porcupine ridge, Cornwall hills, and Promontary mountain respectively. As in 1919, the great bulk of the work in fire control devolved on the forest reserves staff, owing to the difficulty of securing efficient labour.

*Fires Outside Forest Reserves.*—The experiences of 1914 and 1919, both seasons of abnormally high fire-hazard, were duplicated during 1920. That is to say the situation got out of control in the region of the Shuswap lakes, within the boundaries of the Salmon Arm fire-ranging district. The cause was the same, namely, a higher percentage of settlement adjacent to and within the confines of the timber areas, with attendant increased fire-hazard from settlers' fires, and the liability of certain areas to fires started by lightning. In addition to these factors the fire-danger is comparatively high in this region, due to higher daily temperature during hot weather periods, to lower relative humidity, and to greater frequency and higher average velocity of wind. Comparing the seasons of 1919 and 1920, as far as the Shuswap lake and adjacent territory is concerned, the outstanding difference lies in the higher percentage of fires caused by lightning. In 1919, the percentage of fires caused by lightning was 15.5, while in 1920 the percentage rose to 45.6. On the other hand,



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fires from causes under human control decreased to a very important extent and occasioned no great damage. Had it not been for the combination of severe electrical storms, causing fire in inaccessible locations, and coincident high winds, the situation would have been met very satisfactorily.

The record of the control organization in this district was improved very markedly over that of 1919, as the result of reorganization put into effect during 1920. The experience gained as the result of the last two bad seasons has demonstrated clearly that the fire-ranging organization as at present established cannot meet the emergency of a bad fire season; consequently a fundamental reorganization is planned, which will be put into effect partly during 1921.

As indicated earlier in this report, the fire-ranging organizations in the coast and Revelstoke districts were sufficient to cope with the situations arising therein.

*Railway Fire-ranging.*—From the standpoint of railway fire protection the situation in 1920 showed a distinct improvement as compared with 1919. Ninety fires were reported as occurring along railways; of these 50 were extinguished before they had attained a size of one-quarter of an acre. Of the remainder, practically all were brought under control before any considerable damage was done. Right-of-way conditions still leave room for improvement, particularly on the Kettle Valley railway between Hope and Coquahalla pass. The patrols established in accordance with the provisions of General Order No. 107, Board of Railway Commissioners, functioned perfectly during the year. In addition, close and satisfactory co-operation was received from the railways concerned, particularly the Canadian Pacific railway. Of all railway fires 54.4 per cent were attributed to sparks from coal-burning locomotives; consequently the announcement of the Canadian Pacific railway of increased use of coal instead of oil in the mountain section is a matter of great concern to this Service and will necessitate greater effort in preventing and suppressing fires from this cause than was the case when oil was used exclusively.

#### FOREST RESERVES ADMINISTRATION

The appointment of a forest superintendent to take direct charge of the forest reserves administration and the detail of a competent forest ranger to the superintendent's office as forest assistant went a long way toward bringing staff conditions back to normal. Further technical assistance is, however, necessary in order that the necessary detail studies of growth conditions of the timber species occurring in the Railway Belt may be inaugurated.

#### IMPROVEMENTS

Despite the bad fire season a fair amount of improvement work was undertaken and completed during the year. The most important projects were the construction of the ranger's headquarters, including a house, barn, flume, fencing, etc., at Scottie creek, on the Arrowstone reserve. In connection with these headquarters there were also constructed one and a half miles of wagon road and five and a half miles of telephone line. These projects completed the long delayed establishment of the permanent administrative headquarters on this reserve. As indicated above, a lookout station was constructed on Tuktakamin mountain in the Monte Hills forest reserve. This project involved the construction of six miles of trail and five and a half miles of telephone line.

In addition to the above new projects a good deal of work was done on maintenance of existing plant, including repairs to buildings, trails, telephones and fences. The administrative and protection requirements of the reserves require considerable additional work in the line of improvements especially the lookout stations mentioned above and the establishment of telephone communication with reserve headquarters on the Tranquille, Arrowstone, Monte Hills and Hat Creek districts.



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## SURVEYS

During the summer, reconnaissance surveys were completed of the Martin Mountain and Mount Ida forests, and of a portion of the Hat Creek forest reserve. The survey work was handled by students taking the forestry course in the University of Toronto, with very satisfactory results. The assignment of students to work in inspection districts in which they are likely to receive appointment as forest officers, on graduation, is very desirable practice. In this way the men concerned are enabled to get knowledge and experience of the district in which their work is to lie.

## EXPERIMENTAL SEAPLANE OPERATIONS

By an arrangement entered into with the Canada Air Board, an HS2L seaplane was shipped from the seaplane station at Jericho Beach, Vancouver, to Sicamous for the purpose of making experimental flights in co-operation with this Service, with a view to finding out; first, the possibility of operating this class of equipment in the interior sections of the Railway Belt and, second, to study its utility in forest protection and forest administration. Unfortunately, owing to a combination of causes, it was not possible to get the machine to Sicamous until the early part of November, by which time the fire season had terminated, and no data on the use of aircraft in fire work could therefore be obtained.

Assembly of the machine on the beach at Mara lake was completed on November 4 and the first flight from that point to Chase was made on that date, the plane being piloted by Major C. McLaurin, Air Station Superintendent at Vancouver. The next morning the plane flew to Kamloops, from which point trips were made over surrounding country for six days. During the stay at Kamloops the Right Hon. Arthur Meighen, Prime Minister of Canada, made a flight in this machine. On November 12 the plane returned to Sicamous, which was used as a base for flights made during the next three days. Operations terminated on the 15th, with the advent of winter storms. The total distance flown during these operations was 1,729 miles, representing a flying time of 22 hours and 45 minutes.

As a result of these operations, a great deal of useful information was obtained going to show the high utility of seaplanes for forest work in the interior part of the Railway Belt of British Columbia. The machine functioned perfectly and no difficulty was experienced in keeping within range of suitable landing places at any stage of the operations, due to the occurrence of numerous small lakes throughout the country. Contrary to expectations no difficulty was experienced in taking-off from bodies of water situated at comparatively high elevations, and the conclusion come to by the Air Board officer in charge was that the country is ideally situated for the use of hydro aircraft. From the standpoint of the forester it was proved that aircraft will be a most valuable adjunct to forest administration. The uses to which this equipment may be put may be summarized as follows: Exploration and sketch-mapping of timber areas in inaccessible locations, aerial photographic reconnaissance, investigation and exploration of insect infestations, grazing reconnaissance and patrols, fire patrols supplementary to the lookout system, initial and progress reports on fires, especially lightning fires occurring in high, inaccessible places, emergency transportation of supervising officers, check mapping of burned areas in inaccessible locations, restocking lakes by the transportation of fish eggs or small fry.

## PUBLICITY

Owing to continued inadequacy of staff to handle the routine administrative work it was again impossible to pay proper attention to the very important question of placing before the public an adequate conception of the policy and operations



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of this Service. The experience of other countries goes to show that education by adequate and continuous publicity is one of the most important duties of an efficient forest service.

#### SILVICULTURE

The outstanding feature of operations in the line of silviculture was the inauguration of measures to control the infestation of western yellow pine (*Pinus ponderosa*) by the western yellow pine bark beetles, (*Dendroctonus monticolae* and *Dendroctonus brevicornis*) which had become epidemic in Prospect valley situated in township 12, ranges 23 and 24, west of the 6th meridian. Of a total stand of 200,000,000 feet board measure of timber of this species occurring in this locality, it has been estimated that 20,000,000 feet board measure have been destroyed to date by the depredations of these insects.

Control operations comprise felling freshly infested trees, barking them, piling the brush along the prostrate trunk, and burning the whole. These operations must be conducted in the spring of the year, before the beetles emerge from the trees to attack others. This emergence takes place early in June but operations are necessarily closed down somewhat earlier, owing to the impossibility of controlling fire after the warm weather sets in. During 1920, operations lasted from early in April until the 22nd of May. During this time over 3,000 trees, scaling approximately 1,000,000 feet board measure, were felled and burned. Investigations made during the spring of 1921 showed that the infestation had been reduced between 80 and 90 per cent. This is considered an unusually satisfactory record. Examinations made by officers of the Entomological Branch of the Dominion Department of Agriculture, acting in co-operation with this Service, went to prove that had operations not been started during 1920, the entire stand would inevitably have been destroyed. As an instance of the truth of this assertion it may be noted that two small patches of infested trees were left uncut at the expiration of the 1920 operations, owing to the high fire-hazards. An examination in the spring of 1921 showed that the number of trees affected in one patch increased from six to sixty-four, and in the other from six to sixty trees. This goes to show that the epidemic was at its height when control measures were instituted, and that these measures were undertaken just in the nick of time.

Requests were received from the British Government for the collection of a large quantity of seed of Sitka spruce and coast-type Douglas fir to be used in reforestation work in the British Isles. Investigations made by officers of this Service showed, unfortunately, a complete crop failure of both species in the Queen Charlotte islands, Vancouver island, and the lower mainland of British Columbia. It was, therefore, impossible this year to meet the requirements of the British Authorities. Small quantities of seed of inland species were, however, collected for the forestry Department of the Government of New Zealand.

Considerable activity developed in the market for railway ties as a result of the construction of the Kamloops-Vernon branch of the Canadian National Railways through territory immediately adjacent to forest reserves. Four tie sales were awarded during the year to meet this demand, all on the Martin Mountain forest reserve, and they are proceeding satisfactorily.

The strong market for cedar poles resulted in the awarding of a timber sale for that class of material on the Larch Hills forest reserve, and also the resumption of operations on Timber Sale No. 65. A small tie sale was also awarded on the Hat Creek forest reserve.

The timber permit business remained stationary because most homesteaders still have considerable timber on their own lands.



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## SUMMER RESORTS

During the war period the attendance at the summer resorts in the reserves of this district naturally fell off. With the return to normal conditions it is expected that there will be a steady increase in the use of these facilities. Trout Lake summer resort, the longest established, retains its popularity and promises to attract an increased number of summer visitors and cottage residents. The popularity of Paul lake for summer resort purposes is rapidly increasing and local sentiment is demanding very strongly the establishment of a summer resort in that locality.

Except during the earlier part of the season fishing was only fair in both Trout and Paul lakes. This was due in part to the excessively hot, dry season and, in the case of Trout lake, to the fact that the natural increase of the trout has been almost, if not entirely, eliminated by reason of the fact that the flow of Meadow creek, owing to light snowfall, was practically nil and the trout were unable to reach the spawning grounds. If the fishing in this lake is to be conserved steps will have to be taken by this Service to improve spawning conditions and probably to restock artificially to a much greater extent than has been done in the past.

## EQUIPMENT

The purchase of a motor truck saved a great deal of money in connection with the construction of improvements and particularly in fire-fighting work, where the original cost was saved several times over. Portable gasoline fire-pumps were also used to good advantage in fire-fighting work and burning slash.

## APPENDIX No. 6

REPORT OF THE SUPERINTENDENT OF THE FOREST PRODUCTS  
LABORATORIES OF CANADA

W. KYNOCB

In the report on the Forest Products Laboratories of Canada for the fiscal year 1919-20, reference was made to the serious interruption of the work caused by the large number of resignations from the staff during the war and immediately afterward. This period ended with the filling of the vacant post of superintendent, toward the beginning of the fiscal year, and since that time the staff has been rapidly recruited. In all some twelve technical and non-technical officers have been added to the staff and the different divisions are now operating efficiently.

A review of the activities of the various divisions is given below.

## DIVISION OF PULP AND PAPER

The two major investigations carried on during the year by this division were *Utilization of Decayed Aspen* and *Chemistry of Wood*. The object of the first-named investigation is to devise some profitable method of utilizing this waste material of which immense quantities exist in various parts of Canada. The development of such a method would also make it possible to remove the aspen, an inferior wood, from certain areas and to provide for the establishment thereon of more valuable species. The first section of this project, which dealt with the possibility of profitable utilization of the diseased timber by means of wood distillation, was completed, the results indicating that profitable use by this means was not feasible.



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The object of the *Chemistry of Wood* investigation is to establish standard methods for the chemical analysis of pulpwood and pulp, and to carry out a complete study of the chemical character of Canadian pulpwoods. A great deal of work was done on the project and it will be continued in the coming year.

Several minor experimental investigations were carried out, including a series of tests of a wall-board of entirely new composition. Miscellaneous investigations unrelated to pulp and paper but necessitated by demands made upon the laboratories were also carried out by the chemists of the division. These included determination of the free acid content of several woods in connection with use for separators for storage batteries, and a study of methods of protecting wooden tanks used in desilvering mirrors from the action of the acid liquor used in the process.

#### DIVISION OF TIMBER PHYSICS

The major projects handled by this division were: *Wood Sections*, *Decay in Pulpwood and Deterioration of Pulp*, and *Decay of Timber in Buildings*. The *Wood Sections* project provides for the preparation of a complete reference collection of microscopic slides of Canadian timbers and of important foreign commercial timbers. The collection is urgently needed in wood identification and for research purposes.

The investigation into the *Decay of Pulpwood and Deterioration of Pulp* was undertaken at the request of various commercial concerns with the object of working out methods of storing pulpwood and pulp which would eliminate or minimize the decay and deterioration, which at present involve considerable monetary loss. Study of storage conditions of pulpwood and pulp at commercial plants was continued, and at the laboratories an investigation was begun on the effect of storing ground-wood pulp in water, both running water and water renewed at certain intervals. These tests will be continued for a year, at the end of which time the pulp thus stored will be made into paper and subjected to various tests.

The object of the investigation into the *Decay of Timber in Buildings* is to secure exact and detailed information as to the conditions which facilitate the action of various wood-destroying fungi on woods used for interior construction in mills and factories, and to work out procedure and methods by means of which the decay can be prevented. The economic importance of this work is not generally realized. Such decay is the cause of the loss of many thousands of dollars each year in Canada alone. Expert technical advice, made use of at the right time, enables it to be entirely avoided. Detailed studies of decay in mill, factory, and other buildings, supplemented by laboratory determinations, were continued and much of the information secured was published. Some 250 careful studies of decay in large buildings have been made by the pathologist since this work was begun.

A large amount of miscellaneous work was carried out by the division, chiefly at the request of individuals and commercial companies. These items included wood identification, tests of suitability of different woods for special purposes, study of dry-rot fungus in wood and study of moulds and fungi in pulps.

#### DIVISION OF TIMBER TESTS

There were two major and a number of minor projects under way in this division. The major projects were *Testing Clear Specimens* and *Nova Scotia Mine Timbers*. The purpose of the first named investigation is to provide authoritative and complete data regarding the mechanical and physical properties of all Canadian woods of present and possible commercial importance. Since the inception of the work over 17,000 separate determinations have been made, covering sixteen species. Tests were made on five species during the year.



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The object of the investigation of *North Scotia Mine Timbers* is the determination of the relative strengths of the several species now used, or of possible use, in the coal mines of the province for props and booms. The actual tests have been completed and the work of preparing results for publication is now in progress.

Miscellaneous work during the year included that on the development of a method and equipment for testing the strength of counter-board used in footwear, strength tests on portions of airplane parts submitted by the Air Board, tests on wall board and special demonstration tests on the strength of box-car door-posts of red oak and Douglas fir.

## DIVISION OF WOOD PRESERVATION

Major projects in progress in this division were: *Railway Ties*, *Red Pine Paving Blocks*, and *Field Survey of Railway Cross-ties*. The object of the *Railway Ties* investigation is to work out the most suitable methods of dealing with ties at every stage from the woods to the track, the final aim being to lengthen the service life of ties in the track as much as possible. Jack pine and hemlock ties to the number of 100, creosoted according to methods worked out at the laboratories, were installed in the main line track of the Canadian Pacific railway for test under actual heavy service conditions. A seasoning study of 100 hard maple ties was begun. The *Field Survey of Railway Ties* is supplementary to the next preceding investigation. It was undertaken for the purpose of obtaining first-hand information on track conditions and present tie practice on the various Canadian railways and of establishing closer relations with railway officials, with a view to enlisting more active co-operation in our tie investigations. Prominent railway officials in both Eastern and Western Canada have been interested in this work and a large amount of valuable information secured and recorded.

In the *Red Pine Paving Blocks* investigation the aim is to work out a satisfactory method of creosoting this wood for paving blocks. The work, which was in progress for two years, was completed and the preparation of a report for publication is under way.

A considerable amount of miscellaneous work was carried out by the division during the year, including analyses of a number of proprietary wood preservatives, field study to determine the percentage of sapwood in jack pine ties, and work on the creosote treatment of telephone poles, carried out on the Cypress Hills forest reserve.

## LIBRARY

A library of references on the technology of forest products, the manufactures therefrom, and related matters, which cannot be equalled anywhere else in Canada, has been built up at the laboratories during the past seven years and literature bearing on every phase of these subjects has been collected. By a revision of the filing and indexing system all the information contained in the library is now instantly available for the use of the staff in working out the problems presented to them.

## EXHIBITS

There is a continuous and increasing demand from government departments, railway companies, educational institutions, and others for assistance in preparing displays of Canadian forest products and manufactures therefrom. The most notable exhibit work of the year was for the Empire Timber Exhibition held in London in July under the auspices of the British Department of Overseas Trade. The laboratories were made responsible for the Canadian section of this exhibition and the work of collecting, preparing, shipping, and displaying material and products, was carried out by the forest products exhibit specialist. This officer also prepared the catalogue



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covering the Canadian section, attended the exhibition daily to supply technical information concerning Canadian timbers, supervised the disposal of the exhibit to the Imperial Institute, London, after the close of the exhibition, and wrote a report on it, which has been published as Forestry Branch Circular No. 12, "The Empire Timber Exhibition."

Other features of the work in exhibits included the supplying of authentic specimens of Canadian woods to institutions, at home and abroad, requiring them. Seventy sets of typical Canadian woods were applied for and sent to schools throughout Canada, where manual training is taught.

#### INFORMATION FURNISHED

The furnishing of technical information in response to inquiries relating to timber, forest products, and derived products is an important function of the laboratories. This work involves a careful study of the available data on the subject in question and, in some cases, tests or investigations, the final step being the compilation of a report, which is forwarded to the inquirer. Over two hundred inquiries of this kind received attention during the year. From the character of the requests for technical service constantly being received it is evident that study and research along lines not yet undertaken at the laboratories in a systematic way are necessary in order to cover adequately the whole field of forest products work. Provision should be made for dealing adequately with problems in kiln-drying, wood distillation, derived products, and the utilization of wood wastes.

#### GENERAL

A number of technical articles were prepared during the year by members of the staff and published in Canadian and other periodicals. Addresses were also delivered before scientific, technical, and other societies.

Some 365 visitors, an appreciably greater number than last year, called at the laboratories during the year to secure specific or general information or to inspect the equipment and facilities. There is in fact a continually increasing demand for the services of the laboratories.

That the economic possibilities of research and technical service in connection with forest products are very great has been conclusively demonstrated by the valuable results obtained in this field in other countries. Within the past few years laboratories devoted to this work have been established in three countries of the Empire, while in four others similar institutions are now in the preliminary stages of organization.

In Canada, easily the leading timber-producing country of the Empire, and one in which the industries dependent upon timber are, in the aggregate, second in economic importance only to the agricultural industries, the development and maintenance of first-class forest products laboratories is a necessity, if Canadian wood-using industries are to compete successfully with those of other countries.



## PART IV

# RECLAMATION

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### REPORT OF THE DIRECTOR OF THE RECLAMATION SERVICE, E. F. DRAKE

#### CLIMATIC AND CROP CONDITIONS FOR 1920

In the semi-arid belt of Alberta and Saskatchewan another dry year has been experienced, making the fourth in succession; 1917 and 1918 were dry years, 1919 was even drier and owing to the decreasing stores of moisture in the ground, crops were practically a complete failure except where irrigation was practised. The year 1920 has been but little better than the preceding years.

The winter of 1919-20 was mild, with the exception of a cold snap in the beginning of December and another near the end of January; there was fairly heavy snowfall but Chinook winds melted the snow quickly. The weather was thus ideal for wintering stock but, unfortunately, owing to the drought in 1919, there was an acute shortage of feed, and cattle losses were heavy. Spring ploughing was delayed by a heavy snowstorm on March 30 and in April there was exceptionally heavy rainfall, amounting in all to 4.37 inches. At the beginning of May the ground was so wet that it was impossible to engage in farm operations and much of the seeding was not completed until the end of the month. The following months were warm and very dry. In June there were strong winds and considerable soil drifting in certain areas with a consequent loss of about seventy-five per cent of the crop. Up to the middle of August grains and roots generally gave promise of a fair crop, but they could not stand the continued drought and gradually burned up. Another poor crop was the result. The rainfall from June to December was much below normal and the soil was so dry that fall ploughing and work on the land became almost impossible. It was another very disappointing year to the farmer and when winter commenced there was no accumulation of moisture in the soil.

In the two tables which follow, it has been the endeavour to show the relationship between rainfall and yields of certain field crops in Alberta and Saskatchewan. The value of these tables is only comparative, for the crop yields shown cover the entire province without regard to the boundaries of the semi-arid area, while the rainfall records are those recorded at two points only; also no account has been taken of rust, hail, insect pests or other conditions which affect crops in localized areas. Nevertheless, it is clearly shown that there is direct connection between precipitation and yield and that crop yield fluctuates in much the same ratio as rainfall. The results shown in these tables, while true of the province as a whole, do not fairly represent conditions in the semi-arid area where, as already stated, crop results for the most part were very disappointing. It is a fact, however, that in the semi-arid tract, since 1915—a year of unusual rainfall and abundant crops—the precipitation and crop yield have both been considerably below normal because as the stored moisture in the soil decreased as a result of the succession of dry years, the fertility of the land was proportionately reduced.



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TABLE SHOWING YIELD OF WHEAT, OATS AND BARLEY, FOR THE YEARS  
1915-16-17-18-19-20.

ALBERTA

Crop and Year	Yield per Acre	Average price per Bushel	Average price per acre		Yield per Acre	Rainfall at Calgary, April to August	
Wheat —	Bush.	\$	\$	%	%	Inches	%
Normal	22.50 <sup>1</sup>	1 00 <sup>2</sup>	22 50	100	100	11.56 <sup>3</sup>	100
1915...	31.12	88	27 39	122	138	12.27	106
1916...	24.99	1 33	33 24	148	111	8.93	77
1917 ..	18.25	1 74	31 73	141	86	6.63	57
1918.....	6.00	1 92	11 71	52	27 <sup>4</sup>	5.78	50
1919.....	8.00	2 31	18 66	83	36	7.49	65
1920.....	20.50	1 52	31 16	138	91	9.42	82
Oats —							
Normal.....	42.00 <sup>1</sup>	34 <sup>2</sup>	14 28	100	100		
1915.....	45.91	31	13 97	98	109		
1916.....	48.11	46	22 13	155	115		
1917.....	34.00	63	21 42	150	81		
1918.....	22.75	73	16 61	116	54		
1919.....	23.75	64	15 20	106	54		
1920.....	37.25	36	13 41	93	88		
Barley —							
Normal.....	28.25 <sup>1</sup>	50 <sup>2</sup>	14 12	100	100		
1915.....	32.31	44	14 27	101	114		
1916.....	29.04	71	20 62	146	103		
1917.....	22.00	98	21 56	153	78		
1918.....	16.50	97	16 00	113	58		
1919.....	25.50	1 09	27 79	198	99		
1920.....	26.50	62	16 43	117	93		

<sup>1</sup>Average for ten years 1908-17. <sup>2</sup>Estimated. <sup>3</sup>Average for 30 years 1885-1914. <sup>4</sup>Results affected by frost 25th July, 1918.

TABLE SHOWING YIELD OF WHEAT, OATS AND BARLEY, FOR THE YEARS  
1915-16-17-18-19-20.

SASKATCHEWAN

Crop and Year	Yield per acre	Average price per Bushel	Average price per acre		Yield per acre	Rainfall at Swift Current, April to August	
Wheat —	Bush.	\$	\$	%	%	Inches	%
Normal	18.50 <sup>1</sup>	1 00 <sup>2</sup>	18 50	100	100	10.03 <sup>3</sup>	100
1915.....	25.12	91	22 86	124	136	10.14	101
1916.....	16.34	1 28	20 92	113	88 <sup>4</sup>	14.09	141
1917.....	14.25	1 95	27 79	150	77	5.12	51
1918.....	10.00	1 99	20 00	108	54 <sup>5</sup>	5.62	56
1919.....	8.50	2 32	19 72	107	46	7.38	74
1920.....	11.25	1 55	17 43	94	61	7.92	79
Oats —							
Normal	38.25 <sup>1</sup>	34 <sup>2</sup>	13 00	100	100		
1915.....	43.48	32	13 72	106	114		
1916.....	43.06	46	19 81	152	113		
1917.....	27.25	62	16 90	130	71		
1918.....	21.50	70	15 05	116	56		
1919.....	23.10	70	16 23	125	63		
1920.....	27.70	41	11 36	87	72		
Barley —							
Normal	26.75 <sup>1</sup>	50 <sup>2</sup>	13 38	100	100		
1915.....	31.74	46	14 64	109	119		
1916.....	27.00	77	20 79	155	101		
1917.....	21.00	1 00	21 43	157	79		
1918.....	17.00	88	14 96	112	67		
1919.....	18.20	1 08	19 66	147	68		
1920.....	20.25	66	13 35	100	75		

<sup>1</sup>Average for ten years 1908-1917. <sup>2</sup>Estimated. <sup>3</sup>Average for 30 years 1885-1914. <sup>4</sup>Results affected by rust. <sup>5</sup>Results affected by frost 25th July, 1918.



## SESSIONAL PAPER No. 25

## IRRIGATION

The year 1920 has been the fourth dry year in succession in the semi-arid area of southern Alberta and southwestern Saskatchewan. As a result the settlers are becoming insistent in their demands for irrigation as the only remedy for the insufficient rainfall and blowing away of the light top soil by the frequent heavy winds.

The Dominion Government, which administers the surface water supply in the Prairie Provinces, knowing that the available supply is not nearly sufficient to serve all the lands which need irrigation, has always endeavoured to see that appropriated water was put to beneficial use and not wasted. As one dry year followed another and the necessity and value of water for irrigation purposes became more and more apparent, this policy led to the making of extensive surveys to determine the lands best suited for irrigation and to discover the best method of serving them. This, in turn, made necessary the investigation and study of stream flow and storage possibilities. Then in order to make it possible for the farmers living in irrigable areas to co-operate and organize into irrigation districts, the Government, through its Reclamation Service, went further and made complete surveys of a number of tracts, designed the canal systems to serve them, and prepared preliminary plans and estimates of the cost of the required works. All this information was turned over to the people in the districts as soon as they were organized sufficiently to use it. To insure the allotment of water to lands where it would do most good and to protect the extensive surveys completed and under way, an Order in Council was passed on September 6, 1919, reserving the unappropriated waters of certain rivers and streams in southern Alberta until investigations could be completed over the whole area tributary to them to determine where and how these waters could best be applied to beneficial use.

In 1919 negotiations took place between the Minister of the Interior and the Government of the province of Alberta in order that a definite understanding might be arrived at as to the responsibility of each for the survey and further development of irrigation projects within the province. As a result it was decided that the Federal Government would continue to make surveys and exercise supervision as heretofore, but would not assume any responsibility for actual irrigation development beyond this. The Provincial Government, having this assurance from the Dominion, has interested itself in development beyond this point and by passing a new Irrigation Districts Act in 1920 (amended at the session of 1921) and by appointing an irrigation council to supervise and assist in the development of districts, has made it easy for settlers in any area, after they have been assured of the willingness of the Dominion Government to grant a water right, to organize and proceed with the necessary development. Under the provisions of the Act above referred to, several districts were erected in 1920 but a difficulty occurred when one of these, the first to complete preparations and endeavour to raise money for its further development, found that, in spite of the favourable reports of Government and consulting engineers who had investigated the project, it was not possible to sell their irrigation debentures although the lands in the districts were fully pledged as security. The Provincial Government has since made arrangements to guarantee the bonds of this district and of others which may be favourably reported upon by their consulting engineers. This removes the last obstacle and now, with the settlers calling ever more loudly for irrigation, with the line of responsibility between the Dominion and Provincial Governments and the people definitely settled, and with the way to safe and sure financing opened up, there should be substantial development of irrigation in southern Alberta.

In 1919, plane-table surveys were made of a number of irrigable tracts which had been previously located, and comprehensive investigations and studies were made to determine the best methods of storing and distributing flood waters to serve these



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areas. This work was continued in 1920, when nineteen survey and inspection parties which were sent into the field obtained information that will permit of the working up and designing of several large projects.

The following projects, which have been completed and are in full or partial operation, not only serve as object lessons of the advantages of irrigation, but are producing crops and feed each year which are helping greatly to stabilize conditions throughout the whole of the semi-arid district:—

**Canadian Pacific Railway Projects:—**

Western Section, irrigable.. . . .	221,000 ac. .
Eastern Section, irrigable.. . . .	400,000 ac.
Lethbridge Section, irrigable.. . . .	130,000 ac.
Canada Land and Irrigation Co., irrigable.. . . .	202,000 ac.
Taber Irrigation District, irrigable.. . . .	17,000 ac.
Private projects (small), irrigable.. . . .	106,000 ac.
Total.. . . .	1,076,000 ac.

Surveys, reports and estimates have been completed by the Reclamation Service in the following districts, the settlers of which hope to be able to commence construction work during 1921:—

*Lethbridge, Northern Irrigation District to irrigate.. . . .	105,000 ac.
United Irrigation District to irrigate.. . . .	23,000 ac.
Medicine Hat, Southern District to irrigate.. . . .	5,400 ac.
Medicine Hat, Eastern District to irrigate.. . . .	5,000 ac.
Macleod District.. . . .	80,000 ac. (estimated).
Total.. . . .	218,400 ac.

Surveys have been made and estimates worked up in the following districts in which active organization is only in its preliminary stages:—

Retlaw-Lomond, to irrigate approximately.. . . .	100,000 ac.
Lethbridge, Southeastern, to irrigate approximately.. . . .	350,000 ac.
Barons-Carmangay, to irrigate approximately.. . . .	18,000 ac.
Rocky-Coulee to irrigate approximately.. . . .	12,000 ac.
Total.. . . .	480,000 ac.

Survey work under way but not completed includes the plane tabling of certain comparatively small areas in the Lethbridge Southeastern project and the final survey of several small projects lying west of the town of Pincher Creek, preliminary surveys of which were made in 1920. Surveys of very large tracts of land lying north of Red Deer river and south and west of the city of Saskatoon, in what is known as the North Saskatchewan project, are also under way. Reconnaissance, location and level parties will do considerable development work in this district during the present field season.

The work done in each district is outlined more fully in the report of the Acting Commissioner of Irrigation, which is submitted herewith.

#### HYDROMETRIC SURVEYS

Pursuant to the policy of the department to consolidate and co-ordinate the work of its various branches, the work of hydrometric surveys in the provinces of Alberta and Saskatchewan was transferred on July 1, 1920, to the Dominion Water Power Branch, while the Reclamation Service was made responsible for federal interests pertaining to reclamation (both irrigation and drainage) in British Columbia and Manitoba. This rearrangement of responsibility in connection with hydrometric surveys and reclamation work has made possible a higher degree of specialization of work and standardization of methods, with consequent economy and satisfaction to the Government and the public. The transfer of hydrometric survey work to the Dominion Water Power Branch involved the transfer of the hydrometric field and office staff of the Reclamation Service and of practically all of the hydrometric equipment, including the rating station at Calgary. The new arrangement provides for the closest possible co-operation between the Reclamation Service and the Water Power Branch in all matters of common interest.

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\*Now under construction.



## DRAINAGE

The year 1920-21 was the second season of the operation of the Drainage Division of the Reclamation Service. Although the provisions and the working of the Federal Reclamation Act and Drainage Regulations and the similar Provincial Reclamation Acts are but beginning to be known by the settlers in Alberta and Saskatchewan, where there are extensive areas of lands requiring drainage, increasing interest is being shown in drainage as evidenced by the numerous applications and petitions that are being received from those desiring to reclaim small areas of swamp lands, and from communities suffering from flooded and wet conditions.

These laws are proving to be admirably adapted to encourage the reclamation and highest development of swamp lands in Alberta and Saskatchewan, more especially in the northern parts where drainage is most necessary. Several districts in which our engineers have made investigations contain as high as 50 per cent of land that is practically worthless until efficiently drained. Much good land that is at present inaccessible except in winter, on account of intervening swamps, cannot be made available for settlement until roads are made possible by the drainage of the adjacent lands. One extensive district, in particular, abounds in abandoned homesteads, and on account of the wet conditions patented homesteads have frequently changed hands during the last four years at prices varying from \$2.50 to \$9.50 per acre. The new owners now realize, as did those before them, the futility of attempting to work their farms at a profit on account of the amount of land that is unproductive through wet conditions and timbered swamps.

These northern areas are best adapted to mixed farming, dairying and cattle raising, and for a farmer to exist, let alone make a decent living, more hay is required than can be obtained on his own homestead. Men engaged in the cattle-raising business have found that, while feed is fairly plentiful for their needs in summer, sufficient hay cannot be found locally to ensure the wintering of their stock. Conditions were such, before the approval of the Drainage Regulations, that farm after farm was abandoned and the raising of cattle was fraught with too many risks to encourage further development. This very common and widespread disappointment and despair of settlers in many localities is now undergoing a change and many who were on the point of leaving the country have been encouraged to stay by the possibility being opened to them of purchasing swamp lands from the Government under conditions of drainage and on terms that appear satisfactory.

Active and energetic drainage pioneers are invaluable for the development and progress of this north country, and every encouragement should be given to expedite the work of drainage reclamation; in fact herein lies the only hope of converting vast and practically worthless areas into profitable farming districts. Although precipitation is commonly abundant for the growth of farm crops in the northern parts of the provinces, the rain does not always come when most needed and it is often found that a system of irrigation or spring flooding can be combined with drainage at little additional cost, thus ensuring an ideal condition—drainage and irrigation hand in hand. This combination of advantages is, wherever possible, receiving the attention it deserves.

Every drainage scheme successfully carried out by a legitimate settler, making his living and home in the district, constitutes a new link in the chain of prosperous development of the country, produces additional revenue to the province and to the railways, and assists in opening up further territory for settlement. Drainage here is in its infancy and the methods encouraged and permitted to-day will have a far-reaching effect on the future development and agricultural character and prosperity of the areas included and associated with the various drainage projects. Surveys are made and plans prepared by experienced drainage engineers who permit no slipshod, inefficient methods. Every scheme is studied and planned with a view



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to the best and most economical development of the land involved. No partial reclamation for the sake of saving in cost and labour is permitted where a more truly economical result is obtainable by more costly or extensive works, and many applications have not been favourably considered where the land applied for, formed merely a portion of a more comprehensive scheme, too large or too costly to be efficiently carried out by an individual settler. Such a comprehensive scheme, if found feasible and desirable, would be recommended for the consideration of the Provincial or Federal authorities.

The sale price of Crown lands is always likely to be a controversial point between the Government and the prospective purchaser, but valuation by an experienced engineer, taking into consideration all the conditions relating to quality of soil, proximity to town or railroad, climate and the estimated cost of the necessary drainage works, should be sufficient to ensure a fair deal in the interest of the public and in justice to the applicant. At the present time considerable allowance should be made in favour of the applicant, who is in the position of a pioneer, spending possibly the best period of his life in assisting in the opening up of a new country, experimenting on the best treatment of land after drainage, the best crops to grow and methods of tillage, and the results of whose labours will be a guide and help to others. Many of these districts, though reasonably near a railroad, are quite inaccessible by any kind of vehicle until after freeze-up. Living is commonly accompanied by many discomforts and hardships and the conditions are such that it would be almost criminal to attempt to bring up a family amidst such surroundings. These pioneers are not only reclaiming land that they may make a decent living, but are assisting materially in opening up the country for others, making intercommunication possible, winter and summer alike, and giving an added value to lands in which they have no interest. All this should be considered in fixing the sale price of Crown lands.

Besides the large number of small schemes, twenty-nine large drainage schemes were investigated during the season, eight of which, having proved feasible and in the public interest, have been recommended for construction. Two proved feasible but were not recommended for the present on account of their not being as desirable and urgent as many of the others. Eleven were recommended for further and more detailed investigation. Eight proved to be not feasible or desirable.

Of the two recommended for construction in 1919, one, the Waterhen Lakes Drainage project, is now in course of construction.

The schemes recommended for construction would in the aggregate make available 12,000 acres of land that would be at least of equal value to the best lands in the districts in which they are situated, and on account of the large accumulation of plant food that is commonly found in the beds of lakes and swamps, would probably be of more lasting fertility. The margin of profit from the sale of these lands when reclaimed would, it is estimated, not only defray all expenses of engineering and construction but usually be a source of considerable profit, while the indirect advantages of opening up new territory, making the country more habitable, making good roads possible and improving the agricultural condition of the adjacent lands would be of far-reaching and permanent benefit.

There is great need of more reconnaissance work to ascertain the potential agricultural value of the vast areas still unproductive and largely unsettled lying within reasonable distance of railroads. The reclamation and settlement of these areas would undoubtedly contribute much towards placing the railroads on a paying basis, would encourage the influx of a better class of settlers and would put an end to the uneconomical but too prevalent practice of widely scattered settlement beyond reasonable distance from existing railroads and markets.

Although this report is intended to cover the fiscal year ended March 31, it is but fitting that reference should here be made of the death of Mr. Ralph J. Burley, Assistant Director and Chief Engineer of the Drainage Division of the Reclamation Service, which occurred at Cressy, Ontario, on April 14, 1921.



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Mr. Burley entered the service of the department immediately after his graduation in Applied Science from Toronto University in May, 1902. From 1903 to 1916 he was attached to the staff of the Commissioner of Irrigation at Calgary, Alberta, where he acquired a varied and thorough knowledge of all phases of irrigation engineering. In 1916 he was transferred to a wider field of usefulness on the staff of the Superintendent of Irrigation at Ottawa, and in April, 1919, was appointed Assistant Director and Chief Engineer of the then newly organized Drainage Division of the Reclamation Service.

Mr. Burley was a capable engineer of wide experience and sound judgment and his loss to the department and the public service will be seriously felt. His death at the early age of 39 years is deeply regretted.

## REPORT ON IRRIGATION SURVEYS AND INSPECTIONS FOR YEAR ENDED MARCH 31, 1921

By V. MEEK

### *Acting Commissioner of Irrigation and Chief Engineer*

Following the precedent established during the last two years, a summary only of the reports of various members of the staff is submitted. The originals are on file in the offices of the Reclamation Service at Calgary and Ottawa for the information of those desiring more detailed information regarding the work.

#### GENERAL

Although the rainfall was not up to normal in southern Alberta this year, it was fairly well distributed during the growing season, making the conditions much more favourable for crop production than during the previous three years. Notwithstanding this the demand for irrigation, as indicated by the applications received, was nearly as great as during the previous year.

There were 191 new applications received and recorded this year, as against 200 during 1919-20 which was the largest number ever received during one year.

#### ORGANIZATION

The work of the office has been heavier this year than during any previous year of its existence. Exclusive of the Hydrometric Office, which was transferred to the Water Power Branch of this department on August 1, 1920, the staff during the field season when up to full strength was about 240, but this was reduced to 60 during the winter.

In order to accommodate this staff it was found necessary to secure part of the fourth floor of the Lancaster Building. This space is now occupied by that part of the field force which came in for the winter and the temporary office party connected with the large surveys, about thirty in all.

#### WATER ADMINISTRATION

*Revision of Records.*—Owing to the large amount of current work it has been impossible to make as much progress in revising old records as was expected, but the relative priorities have been determined in consultation with the Ottawa office, and in a short time it should be possible to replace the stream folio register and other books by the new water administration records, which will then become the official records of priority.



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*Water quantities.*—In addition to indicating the priority of a scheme the licenses are required to show the quantity of water which may be diverted and also the rates of flow at which diversion may be made at low, high, and flood stages. In order that these figures may correctly represent the value of a license, exhaustive studies are necessary, based on hydrometric and other records. Preliminary steps have been taken with a view to preparing a run-off map of Alberta and Saskatchewan.

*Water Administration Maps.*—Large scale maps showing the outlines of irrigation and other schemes are now in preparation, and are essential for a proper study of water questions in certain districts. These maps are being traced on sheets corresponding in size to the Sectional Sheets published by the Surveyor General, but are drawn to a scale of one inch to the mile with index maps to a smaller scale. It is intended to revise these maps as may be necessary from time to time, and it is expected that they will be of service to other branches of the department. Blue prints of particular areas can be supplied upon request. Twenty tracings have already been supplied in addition to forty rough drafts in process of compilation.

*Hydrometric Survey.*—Although the officers and records of the Hydrometric Service are still available for consultation, the recent transfer of this staff to the Water Power Branch will increase the amount of correspondence, especially with regard to gauge height observations and measurements on irrigation ditches. The measurement of ditches will need special attention in the near future, both as a matter of record and for the purpose of field administration.

*Diversion Changes.*—Owing to physical changes due to various causes it is often necessary to alter the position of the intake of an irrigation scheme or other works constructed under the Irrigation Act.

When these changes are of small extent and will not affect other interests it has been the practice to sanction them without much formality, but in recent years there have been several cases where dams have been washed out and pumping schemes have been installed in lieu at a considerable distance from the original intake.

In order that these schemes may be legally reconstructed, provision has now been made by regulation for applications to be made in a regular form and thoroughly investigated to insure that no other interests may be prejudicially affected. It will then be possible to approve these applications either with the original priority or dating from the subsequent application according to the circumstances of each case.

*P.C. 1859.*—On the 6th September, 1919, an Order in Council was passed (P.C. 1859), reciting the fact that surveys had demonstrated or indicated the feasibility of utilizing practically all the surface water supply in southern Alberta, not otherwise appropriated, in irrigating large areas of land in that district. In view of the inadequacy of water supply to serve all of the lands that might be benefited, it was considered desirable as a matter of public policy that the available supply should be so allocated as to serve the largest possible area of land to the best advantage and in the most economical manner, having regard to the aridity of the various portions of the district, the cost of delivering water to them, and the carriage losses incidental thereto.

The Order reserves all the unappropriated waters of the Oldman river and the Milk river and their tributaries in the province of Alberta, but does not preclude the granting of rights to divert water directly from such streams for domestic, municipal, or industrial purposes nor for the irrigation of areas not in excess of 640 acres, when the land to be irrigated is not more than one mile from the source of such diversion and where application is made in accordance with the provisions of the Irrigation Act.



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The above Order was subsequently confirmed by an amendment to the Irrigation Act. Its practical effect is to protect small schemes by permitting them to be dealt with immediately, while deferring the granting of priority and allocation of water for the larger schemes until they have been thoroughly investigated.

*Duty of Water.*—The duty of water, or the amount required to irrigate an acre of land, was originally fixed at one-hundredth of a cubic foot per second throughout the irrigation season. This was equal to a depth of about 3 feet, but the regulations were subsequently amended to provide the equivalent of about 2 feet depth of water.

In February, 1919, the regulations were further changed to provide for a quantity equal to a depth of 18 inches on the land, measured at the farmers' headgates. It is not, however, always possible to obtain this quantity of water without the construction of elaborate works at prohibitive cost and recent practice has been to regard this depth as a limit to the quantity of water which may be granted for irrigation purposes.

It has, however, been understood that no sale of land will be made when the average supply of water is less than the full legal duty on the area required to be irrigated by the regulations for the sale of lands. It has also been required that all large schemes shall provide the full duty of water, but at the present time one or two schemes are under consideration which contemplate a more extensive distribution of the available water. In such cases the licenses and the plans will clearly set forth the limitation in the supply, and storage will be provided so that the supply to the consumers will be suitably distributed throughout the irrigation season, whether for the full duty or a smaller quantity.

Owing to the urgent need for water and the short duration of flow in certain districts grants may now be made on the basis of the quantity which can be diverted through the works as designed and beneficially used during the period of flow available on the stream. Whenever possible dyking is provided and beneficial use can often be made of 12 inches or even 8 inches of water for the irrigation season, in localities where there is a general scarcity of moisture throughout the year.

In issuing a certificate under section 33 of the Act, "Utilization" is defined as the beneficial use of water for the purpose named in the application.

As the demand for water increases it becomes necessary to limit the grants to practical quantities, both for purposes of administration, and in order that the licenses may correctly represent the estimated limit of available supply and the period during which it is generally available. This information is of value to persons who may wish to purchase lands containing licensed irrigation schemes.

*Preferred Purposes.*—By an amendment to the Irrigation Act (chapter 37, section 4, 4-5, George V) it was provided that, subject to priority, applications should have precedence in the following order, namely:—

1. Domestic purposes.
2. Municipal purposes.
3. Industrial purposes.
4. Irrigation purposes.
5. "Other" purposes.

A further amendment (chapter 55, section 4, 10-11, George V) provides that upon application the minister may cancel an earlier grant in favour of an application for a purpose having precedence in the foregoing order.

The objects of these provisions is to permit a municipality or railway company to acquire a water right by compensating the original appropriator and any other interests which may be affected. Four such applications are now under consideration.

*New Applications.*—Owing to the exceptionally dry conditions in 1919 there was a very large increase in the number of applications received for purposes covered



by the Irrigation Act. These were more than twice the usual quantity and the large increase has been fully sustained during the year 1920, with no signs of any diminution.

*Field-work.*—In order to clear up doubtful questions of fact it is necessary to co-operate very closely with the field inspecting engineers, especially during the winter months when questions can be discussed personally. The Water Administration Engineer has, in addition, made four inspection tours during the year.

*Future Administration.*—The chief object of revising the records and readjusting the existing licenses is to define all water rights as clearly as possible and so reduce the probability of future disputes between water users.

At the present stage of development the demand for water is not sufficient to justify an elaborate field organization of water masters, but the senior inspecting engineer has been appointed a water master under the authority of section 34 of the Irrigation Act. He has been empowered to receive complaints of alleged improper or excessive use of water, and to enquire into the circumstances of all such cases or other cases which may become known to him and to take such action as may be necessary and legal to remedy grievances.

The duties of a water master are in a large measure discretionary and under the present conditions the inspecting engineers are in the best position to explain the requirements of the Irrigation Act and to advise irrigators as to their respective rights and obligations.

The water administration office staff consists of two engineers, one draughtsman and one clerk-stenographer working in co-operation with the field inspection staff and is under the supervision of Mr. J. A. Spreckley, acting as Water Administration Engineer.

INSPECTION WORK

*Special Inspections.*—Domestic, Municipal, Industrial, and Irrigation. This work was carried out under the immediate supervision of the office engineer, Mr. P. J. Jennings. The office engineer supervises the work of all inspecting engineers and particularly those of the special inspectors for Alberta and Saskatchewan. He sees that for each tour of inspection the inspections are properly grouped as regards economy of time, travel, expense and the urgency of a special report. During the year the office engineer examined and checked one hundred and ninety-six plans of all descriptions, including fifty-two descriptions of right of way. One thousand four hundred and thirty-six letters dealing with engineering subjects were written and four hundred and sixty-three reports were dealt with.

Mr. Jennings's report outlines the work carried out by the six inspecting engineers acting under his supervision and from the figures quoted the following is a summary:—

North and East Cypress Hills District—Mr. M. H. French.	
Inspections.. . . .	127
South and West Cypress Hills District—Mr. C. M. Moore.	
Inspections.. . . .	150
Calgary and Cardston Districts—Mr. R. H. Goodchild.	
Inspections.. . . .	63
Alberta Special Inspections—Mr. F. R. Burfield.	
Inspections.. . . .	94
Saskatchewan Special Inspections—Mr. Angus Smith.	
Inspections.. . . .	73

Owing to the continued large increase in the number of applications received for water for irrigation purposes and the requests for surveys and plans the district



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engineers were not able to inspect old licensed or authorized schemes—unless it so happened that they were in the immediate vicinity and had time to spare. During the past year this increase has been maintained and is now more than 100 per cent over any year prior to 1919. A very busy field season for 1921-22 is therefore anticipated.

It has been found necessary to call upon the district engineers for more detailed information regarding watershed areas, boundaries and physical conditions than has been done heretofore, owing to the critical condition of water supply in many of the drainage basins. This naturally entails spending more time on these inspections, but the information obtained is of inestimable value in determining the amount of the grant to be recommended and will constitute a valuable record in connection with future applications in the vicinity.

During the coming year it is proposed to have district engineers install ditch gauges on many of the schemes diverting from streams where the supply has been apparently fully appropriated. These gauges, if regularly and properly read, will furnish valuable information as to the quantity of water being diverted and act as a check upon the stage of flow during which the diversion occurred. In making a start on this work it is fully realized that many difficulties may have to be solved before satisfactory conditions are attained and reliable information secured. For instance, there is wasted—annually—an enormous quantity of the water which is actually diverted at the headgate. This condition cannot be rectified until the time arrives for carefully administering each drainage basin, which will entail appointments of additional water masters. In some of the drainage basins this time may be said to have arrived, as all available stream flow has been appropriated and many applications remain which cannot, under the existing system of administration, be supplied with even a small quantity of water.

## DISTRICT OFFICES

The ever-increasing number of applications for irrigation investigation surveys has brought up the question of furnishing some suitable office accommodation within the districts for our engineers. Arrangements have therefore been made establishing district offices at Medicine Hat and Lethbridge for the use and convenience of district engineers and the public. These offices have been equipped with the necessary office furniture and equipment to enable our engineers to work up their field notes, draft pencil plans and write their reports.

## CYPRESS HILLS DISTRICT

Little real progress in irrigation development appears to have been made in the Cypress Hills District during 1920, due no doubt to scarcity of money consequent upon four dry years. Many large schemes already licensed or about to be licensed are not using the water which is being reserved for their use under the provisions of the Act and new settlers with small holdings are in the meantime being deprived of the benefits of this water. Readjustments or cancellations will have to be considered in the near future unless greater interest is shown by the holders of unused, or partially used, water rights.

## DOMESTIC WATER SUPPLIES

Scattered throughout the provinces of Alberta and Saskatchewan are a large number of small reservoirs in coulees or on well defined watercourses, built by the farmers or ranchers entirely on their own property and for purely domestic requirements. The object of these reservoirs is to store a small quantity of the early run-off or storm water occasioned from sudden heavy rains. The dams are invariably built on watercourses which have no regular discharge beyond that due to snow or periodical



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rain storms and which are dry most of the year. Our inspecting engineers therefore encourage the farmers who have constructed such works to secure water rights under the Irrigation Act. They also explain that while in most cases the existence of the reservoir may not at the moment interfere with other rights, there is always the possibility of newcomers filing applications for diversion and storage above or below them—which might entirely deprive them of the possibilities for future storage and of the legal means of obtaining any. An estimate of the cost of filing memorials and plans is generally given at this time together with an outline of the procedure to be followed. In most cases the total cost does not exceed \$20, i.e., \$10 for the license and \$10 for survey and plans. Advertising is as a general rule waived and the filing of plans can also be waived at the discretion of the minister.

#### MUNICIPAL WATER CONSUMPTION

Records of the daily water consumption for the principal cities and towns in Alberta and Saskatchewan have been tabulated for each town and the monthly and yearly averages obtained. No returns have been received from the city of Calgary owing to the fact that their system is mostly a gravity one from the Elbow river and no measuring devices have been installed. Returns for the portion of the city served from the Bow river by means of pumping would not be of particular value as the area so served varies according to conditions at the headworks of the gravity system. Only incomplete returns have been received from the town of Kamsack and these were not considered worthy of inclusion in the yearly summaries.

#### ARTESIAN WELLS

There has been no opportunity during the past year for gaining any additional information regarding artesian wells.

#### STOCK-WATERING RESERVES

Owing to pressure of other work a comparatively small number of these reserves have been examined during the past season, and in most cases maintenance of the reserve with a view to a better water supply for the settlers in the district or in connection with stock sanctuaries has been recommended.

#### CANADIAN PACIFIC RAILWAY COMPANY'S IRRIGATION PROJECTS

*Western Section.*—The Canadian Pacific Railway Company has disposed of nearly all the land in this section and the larger part of the area is under cultivation. Grain and flax were practically the only crops grown this year.

During the early summer there was a good rainfall and crops gave promise of a large yield, but owing to drought later on they produced somewhat less than was estimated. Had they been irrigated during the dry spell they probably would have produced the estimated yield.

Only about four thousand acres were irrigated in this section this season, as compared with 31,908 acres in 1919. The total irrigable acreage is approximately 221,000.

In accordance with the general policy followed by the company for several years, of replacing the original structures with a more permanent type, a number of the larger wooden structures have been rebuilt with concrete.

*Eastern Section.*—Settlement of this area is proceeding rapidly. No extensions or new construction have taken place this year, but owing to the fact that a large part of the system has been constructed for eight or nine years and colonization held



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up during the war, it has been necessary to do considerable repairing and enlarging of the laterals this year to keep pace with the rapid settlement.

The classification of three large blocks of land in this section has been held up by this office pending further information in regard to soil conditions and drainage.

Two of these blocks, comprising about 36,000 acres of irrigable land, have been released. These are the area northeast of Brooks under the North Bantry canal, and the St. Julien Colony, located south of Tilley.

The third block above mentioned includes all the land served by the Rolling Hills canal. The classification of this area is still being held in abeyance pending a decision of the company in regard to drainage.

During the season of 1920 there were about 60,700 acres irrigated in this section as against 43,400 the year before.

*Lethbridge Section.*—After eighteen years of successful operation, this continues to be the best argument in the province in favour of irrigation. It is reported that the average value of the crops raised during 1920 on the 80,000 acres under crop included in this scheme was \$49.31 per acre. The amount of land actually irrigated during 1920 fell off about fifteen per cent from last year, water being delivered to 60,000 acres. This was due to the climatic conditions being more favourable for raising dry crops than in the previous three years.

The programme for improvement of this system which the company has carried out during the last two years was continued during this year. The enlargement of Chin Lateral No. 1 was nearly completed and Chin reservoir was filled to capacity last fall through this canal. The old headgates and spillway at the lower end of Nine Mile coulee, by which waste water was discharged into Etzikom coulee, have been abandoned, and the Six Mile coulee spillway constructed to take their place. This wasteway takes off the main canal near Chin headgates and consists of a constructed channel with several drops running to the head of Six Mile coulee. The new concrete dam and headgates at Magrath which replace the old timber structure and which were started in 1919, were completed during this season and are now in operation. A considerable portion of the main canal below Pothole coulee in the vicinity of Magrath was enlarged and the banks on the lower side were strengthened. A number of additional timber checks were built in the natural channels to further control erosion.

This system differs from the eastern and western sections which were constructed later, in that the farmers own the smaller laterals which supply them from the company's main distributaries. They have recently awakened to the fact that in order to operate these successfully they must have an organization, and have formed within the last two years, four water users districts under the Irrigation Districts Act of Alberta.

## TABER IRRIGATION DISTRICT

This district was the first to organize under the Irrigation Districts Act of Alberta, having been erected in 1915. After considerable delay they finally entered into a contract with the Canadian Pacific Railway Company in the spring of 1919 to take their bonds and construct the necessary works. The district owns, operates and maintains the system, and the company delivers water to their headgates through the Lethbridge Section canals and the Chin Coulee reservoir.

The construction of the irrigation works for the supply of this district was completed in October, 1920, and water was turned into the system. The ditches were thoroughly primed and about 2,000 acres were fall irrigated.

It was expected that water could be delivered to the district by July 1, but the unusually heavy winds in the spring blew the ditches full of sand and this, together with the difficulty of obtaining sufficient help during the summer, delayed completion until late fall.



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The Canadian Pacific Railway Company improved their reservoir facilities in Chin coulee this year by constructing an additional outlet of 48-inch cast-iron pipe at the Strafford reservoir and by raising the dam of the Chin Butte reservoir about seven feet to the full height proposed.

The works have now been officially turned over to the district, and it is expected that a larger part of the 17,000 acres under the system will be irrigated this coming season.

#### THE SOUTH SASKATCHEWAN DIVERSION PROJECT

A brief history of this project was published in the last annual report.

The Saskatchewan Water Supply Commission, which was appointed by the Provincial Government in 1920, has now published its report from which the following is compiled:—

It is proposed to divert from the South Saskatchewan river by pumping at a point about three miles from Elbow, Saskatchewan, an average of about 12,000,000 Imperial gallons per day with a maximum of 16,000,000 per day during the short time of excessive consumption each year. This is equal to a diversion rate of about twenty-three to thirty cubic feet per second.

They propose to distribute the water through concrete, wood-stave and steel pipe lines for domestic and municipal purposes to a district covering some 1,620 square miles, in which there are resident about 85,200 people. About three-quarters of this population, however, is in the two large cities of Moosejaw and Regina. The balance is distributed among some thirty-four towns and villages and other rural communities within this area. They estimate that the water can be delivered to the consumers at a rate not to exceed one dollar per thousand gallons.

The cost of construction is to be met by sale of debentures secured by the total assessable property within the district.

It is the purpose of the commission to submit the matter to a vote of the district during the coming summer. Mr. A. J. McPherson, of Regina, is the chairman of the commission.

#### SEVEN PERSONS DRAINAGE BASIN

*Investigation.*—This work was begun late in the fall of 1919 and has been continued during 1920, with the result that two irrigation districts have been organized in this basin under the Irrigation Districts Act of the province of Alberta, known as the Medicine Hat Southern and Medicine Hat Eastern Districts.

The Southern project extends from the town of Sevenpersons on the Lethbridge-Crowsnest section of the Canadian Pacific railway northeasterly along the line of the railway nearly to the southern limits of the city of Medicine Hat. The Eastern project adjoins the Southern on the north and includes the land between it and the southern limits of the city and extending easterly between the railroad and Ross creek to a point about five miles east of the city. The proximity of this land to the city of Medicine Hat affords a ready market, and the fact that the Canadian Pacific railway traverses the tract for almost its entire length, giving easy access to transportation, makes these projects particularly attractive.

*Water Supply.*—The water supply for these two projects is taken from two streams, Ross creek and Sevenpersons creek, which rise in the Cypress hills and flow into the South Saskatchewan at the same point within the limits of the city of Medicine Hat. The records of the discharge of these streams extend over a period from 1913 to date, in the case of Sevenpersons creek, and 1911 to date in the case of Ross creek. The observations on Sevenpersons creek have been taken at Medicine Hat; those for Ross creek at Irvine, about eighteen miles east of the city. The duration of flow in both streams is quite similar. The larger part of the run-off comes during March and April. In exceptional years it may begin in February or



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extend into May, but usually it has practically stopped by the first of June. This makes it imperative, in order to irrigate any large areas after the first of May, to have some means of storing the water for use later in the season. Reservoirs have, therefore, been provided for this purpose in connection with both these projects.

A detailed study of the water supply for these two projects shows that if they had been in existence during the period over which records were taken there would have been water sufficient to give the irrigations shown in the following table:—

Medicine Hat Southern District (Sevenpersons Creek)				Medicine Hat Eastern District (Ross Creek)			
Year	Depth Irrig. Inches	Rain- fall Inches	Total Water Rec'd Inches	Year	Depth Irrig. Inches	Rain- fall Inches	Total Water Rec'd Inches
1911.....				1911.....	10	10.0	20.0
1912.....				1912.....	17	6.7	23.7
1913.....	10.0	6.7	16.7	1913.....	12	6.7	18.7
1914.....	3.0	3.5	6.5	1914.....	6	3.5	9.5
1915.....	12.0	11.2	23.2	1915.....	18	11.2	29.2
1916.....	18.0	12.6	30.6	1916.....	18	12.6	30.6
1917.....	18.0	3.3	21.3	1917.....	18	3.3	21.3
1918.....	18.0	5.0	23.0	1918.....	17	5.0	22.0
1919.....	12.0	2.9	14.9	1919.....	4	2.9	6.9
1920.....	13.5	5.0	18.5	1920.....	14	5.0	18.5

The table shown above is based on an irrigation factor of 83 per cent in the case of the Eastern project and 100 per cent in the case of the Southern project.

It should be noted that neither of these projects will be able to get the full duty of water (eighteen inches) every year. While the Government experiments in the duty of water indicate that to produce during the dryer seasons the maximum yield of those crops which require the largest amount of water it is necessary to apply during the season a quantity of water equal to 18 inches in depth over the irrigated area, it does not necessarily follow that the application of a lesser quantity will not produce a profitable crop.

On account of the bulk of the water running into the reservoirs in the early spring it will be possible about the first of May each year to forecast the quantity of water available for irrigation during the season. This makes it possible in years of shortage, like 1914 and 1919, to deliver double the quantity to half the area, thereby ensuring a good crop on half the land instead of practically no crop or a very poor one on the whole area.

## THE MEDICINE HAT SOUTHERN DISTRICT

The works as designed comprise a reservoir of 24,506 acre-feet capacity, a diversion dam, headgate and ditches and a small auxiliary reservoir with a capacity of about 900 acre-feet.

There are 134 quarter-sections in the district as organized, or 21,440 acres, but because of scanty water supply the works have been designed with a view to irrigating not in excess of about forty acres on each quarter-section—or 5,300 acres in all. Should it ever become possible in the future to augment the water supply from any other source a considerable additional area can be irrigated merely by constructing additional laterals or distributaries.

On the basis of the prices of labour and materials in December, 1920, the works as designed were estimated to cost \$263,955, which on the basis of 5,300 acres is at the rate of \$49.80 per acre irrigated. On the basis of 1921 prices these works could probably be built for considerably less.



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## THE MEDICINE HAT EASTERN DISTRICT

The works for this district comprise two reservoirs known as the "Ross Creek" and "Gros Ventre," with capacities of 8,220 acre-feet and 5,967 acre-feet respectively, a wood-stave pipe of 44-inch diameter to carry the water across the valley of Bulls-head creek, and the necessary canals and laterals.

The irrigable area comprises 5,000 acres and the estimated cost of the works, on the basis of prices in December, 1920, was \$306,330, or \$61.27 per irrigable acre. In this case also the works could probably be built for considerably less on the basis of present prices.

*Water Supply.*—The water supply for both these projects is admittedly less than could be desired, but because of the known aridity of the district which precludes the successful practice of agriculture without irrigation, and the proximity of railways and markets, it is believed that the beneficial results of irrigation in those years in which water is available will amply justify the cost of the required works.

The trustees of both these districts have asked the Provincial Government to authorize the issue of bonds to cover the cost of construction. The provincial authorities have referred both cases to a consulting engineer whose report, while not yet made public, is believed to be unfavourable—chiefly because of uncertain and supposedly inadequate water supply. Under these circumstances it is unlikely that the province will guarantee the bonds of these districts and construction will probably be deferred indefinitely.

## CANADA LAND AND IRRIGATION COMPANY

This has been an eventful year for this company. Work was begun on the construction of this system in 1909 and after encountering many difficulties, both financial and constructive, they delivered water to a small acreage for the first time this year (1920).

Water was turned into the canal from Lake McGregor reservoir on April 29, and with the exception of a few days ran continuously throughout the season. Between four and five thousand acres in the Vauxhall district were irrigated, this being all the land which was ready for water this year.

The results from irrigation during 1920 were highly satisfactory on the comparatively small acreage actually watered. A thriving town had sprung up at Vauxhall, several thousand acres of land had been sold and prepared for irrigation in 1921, and the company expects this year to irrigate not less than 10,000 acres in this district. The work of constructing lateral and distributing ditches is proceeding as rapidly as justified by land sale, while at the same time the main canals and other works are being enlarged, strengthened and improved.

During the summer the chief engineer and manager, Mr. D. W. Hays, under whose able management the work has proceeded to date, resigned, and his place has been filled by Mr. F. W. Hanna, formerly of the United States Reclamation Service.

## LETHBRIDGE NORTHERN IRRIGATION DISTRICT

Surveys for this project were begun in 1914 and completed in 1916. The annual reports of this branch for 1914, 1915 and 1916 give a detailed account of the work. In 1917 a reservation of water from the Oldman river was made for the benefit of this land.

Application for the formation of this area into an irrigation district under the Irrigation Districts Act of Alberta was made on July 31, 1919, and the order erecting the district was published in the *Alberta Gazette* on October 31, 1919. A corrected notice of erection was published under date of November 29, 1919.



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In November, 1919, the trustees appointed Mr. H. B. Muckleston as their chief engineer. The Alberta Government employed Mr. George G. Anderson, a consulting engineer, who submitted a report on the project on January 17, 1920. This was later published in pamphlet form.

Authorization for the construction of works was issued by the Minister of the Interior on March 9, 1920, with the proviso that before the construction of any part of the works was undertaken, complete plans thereof would be filed and approved as required by sections 15 and 16 of the Irrigation Act. Later the district was enlarged to include the area known as the North Macleod project, and the district surrendered this authorization, and a similar one, dated September 8, 1920, was issued.

During the past summer the interest in irrigation was apparently revived in those areas which were originally included in our surveys for the project but in which at the time of organization the sentiment was against inclusion in the Lethbridge Northern Irrigation District. These areas were the Barons-Carmangay, Rocky Coulee, and North Macleod areas. The revival of interest resulted, however, in only the North Macleod District petitioning to be included. This makes the total irrigable land in the Lethbridge Northern District 104,758 acres. The order for this enlargement was published in the *Alberta Gazette* of August 14, 1920. The Provincial Legislature during the session of 1921 passed an Act guaranteeing in full the principal and interest on the bonds of the district, amounting to \$5,400,000—a sum estimated to be sufficient to cover the entire cost of construction. This Act also provides that the Irrigation Council of the province shall themselves take the necessary steps to let a contract for the construction of the works, and shall exercise general supervision over the trustees in all important matters affecting contracts, construction, etc.

It is understood that the bonds will shortly be offered for sale with this guarantee, which should assure their sale at a good price. It seems quite probable, therefore, that construction on this project will be commenced this summer.\*

## BARONS-CARMANGAY AND ROCKY COULEE DISTRICTS

During the spring of 1920 the Irrigation Council of Alberta investigated the sentiment in these two districts with regard to inclusion in the Lethbridge Northern Irrigation District. It was found that the residents of the Barons-Carmangay area were three to one in favour of inclusion, but unfortunately about fifty per cent of the land was held by non-residents, only a few of whom replied to the correspondence sent them. The sentiment in the Rocky Coulee District, however, was overwhelmingly in opposition to irrigation. These two projects were therefore not included in the Lethbridge Northern Irrigation District.

## SOUTH MACLEOD IRRIGATION PROJECT

In the year 1916, a party in charge of Mr. T. M. Montague located a canal from the Oldman river to command a portion of the area now known as the South Macleod District. It was proposed to use the same intake as the Lethbridge Northern project. The irrigable area was estimated at 9,500 acres in townships 8 and 9, ranges 24, 25 and 26. In 1919 the landowners in townships 6 and 7, ranges 25, 26 and 27, petitioned the Government to include their land, and the necessary surveys were undertaken to determine the feasibility of irrigating this additional area.

Since it was not possible to command the whole of these lands from the Oldman river, other sources of water supply were investigated, such as the possibility of extending the United and Lone Rock system. It was finally decided as the result of a reconnaissance that the most economical development to serve the whole area was to divert water from the Waterton river.

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\* NOTE.—Bonds to the amount of \$2,400,000 have been sold and contracts have been let for the earth work; further sales of bonds will be made as required.



A standard twelve-man party in charge of Mr. N. M. Sutherland was assigned to this work and surveys were commenced about the first of June, 1920. The main canals and such of the secondaries as were necessary to determine the command area were located by the first of August. Mr. Sutherland's party was then reorganized with a view to completing plane-table surveys of the area under the project. On October 1, a second plane table party in charge of Mr. A. B. Cook was transferred to this work and these two parties completed the field surveys on December 7. During the field season the party under Mr. Sutherland completed the following work in 148 working days: 164 miles of traverse with profile and topography; 116 miles of levels; 51,800 acres of plane-table topography.

Mr. Cook's party completed in 57 working days: 122 miles of levels; 40,645 acres of plane-table topography.

Mr. P. A. Fetterly made a general survey of the soil of the project, taking fifty-four groups of samples at carefully chosen average points covering the whole district. These samples were tested for alkali with an electrolytic bridge with the following results:—

36 groups showed no alkali.						
9	"	"	moderately strong alkali	from 3 to 5 feet		
3	"	"	"	"	"	1.5 to 5 "
5	"	"	"	"	"	0.5 to 5 "
1	"		(not completed).			

The land represented by the eight groups of samples showing moderately strong alkali within three feet of the surface was reserved for further investigation during the coming field season. The district as a whole is considered to be comparatively free from alkali.

The land surface in the southern portion of the district is smooth and fairly uniform but has a heavy slope to the north and east. South and east of Macleod the surface is more rolling and there are numerous depressions which have no natural drainage. In classifying this land a sufficient acreage of the low areas was classed as non-irrigable to contain the drainage from the surrounding irrigable lands. The soil varies from clay loam to sandy loam and in the northerly sections has a tendency to drift, owing to the prevalence of high winds. In some places the loosened portion of the top soil has entirely blown away, exposing the trails left by the plough when the land was broken. The practice of irrigation, and especially the growing of alfalfa, would obviate this difficulty by supplying sufficient root fibre to hold the soil in place.

The main and branch canals have been designed for the same maximum requirement as used on the Lethbridge Northern, i.e., of a sufficient size to irrigate fifty per cent of the total area six inches in depth in a period of fifteen days. Seepage losses were estimated at six second-feet per million square feet of wetted area. The total irrigable area is approximately 61,000 acres, which is subject to a slight revision on a more complete soil investigation. A gross main canal capacity of 633 second-feet is required at the intake.

Assuming an irrigation factor of eighty per cent and an eighteen-inch duty of water, the water requirements are as follows:—

Net water required on 61,000 acres.. . . .	73,200 ac.-ft.
Seepage losses at 20 per cent of the water diverted.. . . .	18,300 ac.-ft.
	<hr/>
Total water required.. . . .	91,500 ac.-ft.



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The following is an estimate of the average monthly requirement during the irrigation season:—

May, 12 per cent.. . . . .	11,000 ac.-ft.
June, 35 per cent.. . . . .	32,000 ac.-ft.
July, 30 per cent.. . . . .	27,000 ac.-ft.
August, 15 per cent.. . . . .	13,700 ac.-ft.
September, 8 per cent.. . . . .	7,400 ac.-ft.
100 per cent.. . . . .	91,500 ac.-ft.

There are no prior appropriations of any size on the Waterton River drainage basin, and a study of the hydrometric records since 1908 shows that the above monthly amounts are available from the natural flow of the stream, even in a low-water year.

The site for the diversion weir and intake is located on the Waterton river in the NW.  $\frac{1}{4}$  section 18, township 5, range 27. The river at this point flows in a straight, well defined channel close to the left bank, which is twenty-five feet in height. It is proposed to construct a concrete weir 550 feet in length with a maximum height of seventeen feet, which will raise the water-level to the required height to enable the diversion canal to be located on the first bench of the river valley, in a good clay material, well away from any flood action. No attempt was made to ascertain the character of the underlying material, but from surface indications and for estimate purposes it is assumed that the headworks will rest on a pervious foundation. The weir was designed to pass a maximum flood of 20,000 acre-feet.

The estimated cost of construction, based on 1920 prices and a total irrigable area of 61,000 acres, is \$27.72 per acre. Unit prices have fallen considerably since the estimate was made and it is believed that any revision will be in a downward direction. The landowners under the scheme are well organized. A petition for the organization of a district under the Irrigation Districts Act was forwarded to the Minister of Public Works of Alberta early in 1920. Further action was delayed until the field surveys were completed and the feasibility of the project determined.

## IRRIGATION DEVELOPMENT ASSOCIATION

This association is still actively engaged in furthering irrigation interests in southern Alberta. A great deal of activity which has been started by this organization has now been transferred to the officers of the various districts which have organized under the Irrigation Districts Act of Alberta.

There are many matters, however, which are common to all districts, and this organization affords a central medium through which they can be handled to better advantage than by the individual effort of each district.

## WATER USERS ASSOCIATIONS AND DISTRICTS

The Lethbridge-Coaldale Water Users Association is a voluntary organization which was formed in July, 1918, for the purpose of furthering the interests of the farmers under the Lethbridge section of the Canadian Pacific Railway Company's irrigation system located east of Lethbridge.

The activities of this organization have been to some extent superseded by four Water Users Districts which have been organized more recently and which cover practically the same territory.

The organizations were formed under the Alberta Irrigation Districts Act for the purpose of operating that part of the system under which they were located, and are as follows in order of their location:—

Ready Made Water Users District.

East Lethbridge Water Users District.



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Coaldale Water Users District.

Cameron Water Users District.

The first of these districts has been in successful operation ever since its erection in February, 1919. The three remaining were formed in 1920, but as yet have not shown any great activity.

#### UNITED AND LONE ROCK IRRIGATION DISTRICTS

The field-work was finished and an estimate made of these projects in 1919. The two projects contain about 23,265 acres irrigable and it is estimated that the works can be built for about \$19 per acre.

These two districts are watered from the same system and under date of January 5, 1921, a majority of the owners of land under the Lone Rock District petitioned the Minister of Public Works of Alberta to be included in the United Irrigation District which had already been organized.

The Minister of the Interior gave his consent to this on February 28, 1920, and an order for the dissolution of the Lone Rock Irrigation District was signed by the Provincial Minister of Public Works on March 2, 1921. On the same day he issued an order changing the content of the United Irrigation District to include the former Lone Rock District. The order provided that the enlarged United District should assume the liabilities of the former Lone Rock District. The Provincial Government employed Mr. D. W. Hays to make a report on this project and inform them as to the advisability of their guaranteeing the bonds of this district. The report has not been made public on the date this report is submitted.

#### THE SOUTHERN IRRIGATION DISTRICT

The order for the erection of this district was published in the *Alberta Gazette* March 31, 1920, where a description of the land included may be found.

The condition of this district is practically the same as set forth in the last annual report. Apparently nothing can be done towards constructing works to serve this land until we have finished the design and estimate for the whole Lethbridge Southeast project, of which this is a part.

As stated in the last report, a portion of the area within this district is at present served by the Lethbridge section of the Canadian Pacific Railway Company's irrigation system. A party has been assigned to determine this year how much of the remaining land in the district is irrigable.

#### THE PROPOSED NEW DAYTON IRRIGATION DISTRICT

Petitions have been circulated for the formation of this district but the order for erection has not yet been issued. This district adjoins the Southern District on the east. The original intention was to make the line between range 15 and range 16 the eastern boundary. This, however, leaves out considerable land in township 4 and township 5, range 15, which can be served by the same distributary. It is, therefore, desirable that this land be included within the New Dayton District.

#### THE PROPOSED WARNER-MILK RIVER IRRIGATION DISTRICT

The petitions for the erection of this district have been submitted to the Provincial Government but the order for erection has not yet been issued. The condition of this district is the same as set forth in the last annual report. The project is a part of the Lethbridge Southeast project and any development of this area must be considered in connection with the development of the larger project.



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## THE PROPOSED MASINASIN IRRIGATION DISTRICT

This district adjoins the New Dayton Irrigation District on the east and includes the land in the area known as Tract 7-B (see report on Irrigation Surveys, 1918-19) of the Lethbridge Southeast project. Petitions are being circulated for the erection of the district.

## LETHBRIDGE SOUTHEAST PROJECT

Plane-table surveys for the development of this project were commenced in 1919, but only a small area was completed in that year. An attempt was made in 1920 to complete these surveys and for this purpose six parties were placed in the field; one location party consisting of twelve men and five plane-table parties of twenty-seven men each.

The character of the work necessitated the employment of a very large number of experienced men and there was great difficulty in finding a sufficient number properly qualified, which materially delayed the work at the beginning of the season. After the parties were organized it was found necessary to devote considerable time to the training of some of the less experienced men, in order to get the parties into efficient working condition. In spite, however, of these difficulties, fairly good progress was made. Work was begun about May 22 and the several parties thereafter took the field as soon as their personnel was complete. The first party was disbanded towards the end of October and it was found necessary to disband another party about the first of November. In both these cases the cause was the impossibility of keeping a sufficient number of properly qualified men. When by reason of loss of men a party fell below efficient working strength, it was disbanded and the remaining personnel was used, as far as possible, to fill vacancies in the other parties.

During the comparatively short field season the five plane-table parties surveyed a total area of 591,973 acres, which area was also tentatively classified in the field. The daily average rate per plane-table day was 252.2 acres, computed on the basis of actual working days.

The method adopted for the work was to have the main canals and principal laterals located in advance of the plane-table parties, so that the area to be covered by the latter would thereby be delineated, thus precluding the possibility of surveying any lands above the canals which would of course be non-irrigable. The work was also planned so that the several plane-table parties would never be widely separated, but always be in touch with one another and with a central camp where the inspector of plane-table work made his headquarters and where there was maintained a portable field garage for the prompt repair of the large number of motor-cars used in connection with this work.

Surveys were commenced in the district north and east of Magrath and south of Raymond and thence carried easterly to Pakowki lake and from that point north and west to Chin coulee and to the boundaries of the Taber Irrigation District.

The location party after completing the survey for the main canals and reservoir sites was moved on 22nd November to Waterton lakes where it was intended to make a complete survey on the ice of the upper lake, with a view to its use as a storage reservoir. The lake, however, did not freeze solidly enough to permit of such a survey and therefore only a small portion of the work was done, consisting chiefly of the survey around the townsite within the Waterton Lake Park. The party was disbanded about the middle of December, 1920.

In addition to the five survey parties previously referred to, a small party equipped with a light rotary rock drill, sunk a number of test holes at the proposed dam site on the St. Mary river at section 9, township 1, range 25, west of the 4th meridian, in order to determine the feasibility of constructing a dam on this site. This party



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took the field on February 17, 1920, but owing to severe weather and bad roads, the drill and other equipment which had been freighted from Cardston to the proposed site, a distance of seventeen miles, was not actually put into operation until March 3.

The equipment of the drilling party consisted of a McKernan-Tierney rotary drill, class "Z-1," an 8-horsepower gasoline engine, a centrifugal pump and the necessary equipment and accessories. During the field season ten test holes were sunk to depths varying from thirty-five to ninety feet. An accurate log of each hole and the progress of the work was kept plotted up to date on a map. From a study of the logs of the several test holes and the character of the rock it appears that this foundation is suitable for any type of dam. Comparative estimates must hereafter be made to determine the most suitable type, but the type which has been tentatively designed and seems to be the most economical is a rock-filled dam.

While survey work was in progress a careful examination of the land was undertaken by an additional party. This work was undertaken on the first of September and was continued until November 10, during which period 267 soil groups, which were carefully chosen throughout the tract, were tested with the electrical bridge apparatus in order to determine their alkali content. Five samples, which were assumed to be typical of the general soil conditions within the district, were forwarded to Ottawa for chemical analysis in order to confirm, or otherwise, the results obtained by the electrical bridge tests. The field tests with the electrical bridge showed the following results:—

130 groups showed no alkali.

82 groups showed no alkali at depth of 5 feet.

37 groups showed alkali at depth of 3 to 5 feet.

8 groups showed alkali at depth of 1.5, 3 and 5 feet.

10 groups showed alkali at all depths.

All soils which showed a resistance when tested of less than 190 ohms. were classed as alkaline.

While as a result of this soil examination certain small areas of land have been excluded and a few other small areas have been reserved for further examination, the district as a whole was found to be comparatively free from alkali and the soil is believed to be well adapted to irrigation.

In order that the results of the field-work might be plotted and correlated a small office staff was maintained in Calgary through the season. This staff was somewhat augmented at the close of the field season by the addition of some of the field engineers. Considerable progress has been made in working up the results of the surveys but a very great deal of work yet remains to be done. The small office staff previously referred to will be employed continuously upon this work throughout the summer of 1921, while, at the same time, efforts will be made to complete the field-work.

#### CROWSNEST PASS IRRIGATION DISTRICT

During the year 1919 when it was realized that there was a probability of the Lethbridge Northern Irrigation project being constructed, taking their water supply from the Oldman river, the occupants of lands higher up on the stream became interested, and a number of resolutions from various local unions of the United Farmers of Alberta and also from the Board of Trade of Pincher Creek were forwarded to this office requesting the Dominion Government to make the necessary surveys to determine the feasibility of irrigating a large area of land tributary to the Oldman, Crowsnest and Castle rivers.

A standard twelve-man party organized in the spring of 1920 under Mr. S. H. Hawkins was accordingly placed in the field to make the necessary surveys and investigations.



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This party was assembled at Cowley, Alberta, on May 29, and field-work was commenced at the "Gap" on the Oldman river section 31, township 10, range 3, west of the 5th meridian on May 3. This work was continued until November 15, when the party had to disband on account of bad weather.

During the season the following work was completed:—

Contour survey of the "Gap" reservoir on the Oldman river, townships 10 and 11, range 3, west of the 5th meridian.

Contour survey of reservoir site on Castle river at Canyon creek, township 6, range 2, west of the 5th meridian.

Contour survey of reservoir site on Gladstone creek, township 5, range 2, west of the 5th meridian.

Contour survey reservoir site on Pincher creek township 6, range 30, west of the 4th meridian, and range 1, west of the 5th meridian.

Contour survey of reservoir site on Five-mile creek, township 9, range 29, west of the 4th meridian.

Contour survey of dam site at Castle River reservoir site, section 30, township 6, range 2, west of the 5th meridian.

Preliminary survey for main canals and lateral system over the Todd creek area, townships 8 and 9, ranges 1 and 2, west of the 5th meridian.

Preliminary survey for main canals and lateral system over the Pincher creek east area township 6, ranges 29 and 30, west of the 4th meridian.

Reconnaissance and section line levels over the Pincher creek north area, townships 6 and 7, ranges 29 and 30, west of the 4th meridian, and range 1, west of the 5th meridian.

Preliminary survey for diversion canal from Gladstone and Mill creeks to the Pincher creek areas.

Reconnaissance of the Beaver creek area, townships 7 and 8, ranges 28 and 29, west of the 4th meridian.

The result of the field-work is summarized in the following tables. The estimates of cost are based upon 1920 prices and are merely approximations, subject to later and more detailed calculations.



SUMMARY OF RESERVOIRS OLDMAN RIVER

	Location	Flooded Area Acres	Capacity Acre-Feet	Total Cost	Cost per Acre-Feet	Remarks
"Cap" Reservoir.	Tps. 10 and 11, rge. 3, W. 5th M	1500	90,000	\$612,232.50	86.80	Rock fill concrete faced dam
Castle River Reservoir	Tp. 6, rge. 2 and 3, W. 5th M	800	30,000	219,299.50	7.30	"
Canyon Creek Reservoir	Tp. 6, rge. 2, W. 5th M	1000	40,000	292,974.00	7.32	"
Pincher Creek Reservoir	Tp. 6, rge. 30, W. 4th M	200	5,000	120,000.00	24.00	"
Gladstone Creek Reservoir	Tp. 5, rge. 2, W. 5th M	30	1,000	30,000.00	35.00	Cost not worked out in detail.
Five-mile Creek Reservoir	Tp. 9, rge. 29, W. 4th, M	200	3,500	105,000.00	30.00	Earth dam.

CROWSNEST IRRIGATION DISTRICT

	Estimated Irrigable Acres	Estimated Cost Structures	Estimated Cost Main Canals	Total Cost	Cost per Acre
Todd Creek Area	8600	\$201,627.5*	\$21,405.00	\$423,032.50	\$ 49.29
Pincher Creek East Area	7200	* 258,720.00	64,157.50	322,877.50	44.84
Pincher Creek North Area	9000	Detail costs not taken out. (Area and cost from reconon	viously high	issuance only)	and in excess of \$50 per acre.
Beaver Creek Area	2600	Detail costs not taken out. (Detail costs not taken out. Ob	viously high	143,495.00	55.30
Cowley Area.....	3000	Detail costs not taken out. (Detail costs not taken out. Ob	viously high	and in excess of \$50.00 per acre	

\*Includes Reservoir \$120,000.



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Water for the Todd creek area would be taken from the Oldman river at section 10, township 10, range 2, west of the 5th meridian. A main canal ten miles in length is required to reach the irrigable lands. Although the estimated cost is \$49.20 per irrigable acre, which is considerably lower than at first thought possible, four miles of this canal is on side-hill in excess of forty degrees and it is considered that this piece of canal would be very difficult to construct and maintain. Although allowance has been made in the estimate for heavy work here and a number of bench flumes, it is doubtful whether the scheme could be constructed for the figure shown in the table. These four miles of canal make the feasibility of the project very uncertain because it is not possible to determine just what contingencies may arise in construction. This scheme is not considered a feasible one at the present time.

The estimate of cost to irrigate the Pincher creek north area is necessarily very approximate. The irrigable area was determined by running levels over section lines, and although some preliminary line has been run for main canal, it was found that the route was so difficult that the scheme was not considered a feasible one, and therefore was not surveyed in any detail. The estimate of cost has been based partially on actual surveys, but largely upon a reconnaissance. This scheme is not considered feasible at the present time.

More detailed surveys were made of the Pincher creek east area. Except for the storage reservoir required on Pincher creek, this is a very cheap and simple scheme. Water can be carried to the irrigable lands by means of a main canal four miles in length, and even with the comparatively expensive reservoir required on Pincher creek, the estimated cost per acre is less than \$45. The land in this area is comparatively heavy and not so well adapted for irrigation as the Pincher creek north area.

No surveys have yet been made of the Beaver creek area. It is estimated, however, that there are some 9,000 acres which could be irrigated. A study has been made of the water supply of Beaver creek and although the records of stream flow are very incomplete, it was estimated that there is only a sufficient quantity of water, with a storage reservoir on Five-mile creek of 3,500 acre-feet capacity, to irrigate some 2,600 acres. A very approximate estimate of cost to irrigate this area was made and the cost determined at \$55.30 per acre.

A reconnaissance was made of the Cowley area and the estimated cost is based on this reconnaissance. Water could be carried to this area by means of a grade canal twelve miles in length, or by utilizing the water-power available at the falls near Lundbreck and pumping to a point on the side-hill carrying the water to the land by a canal about five miles in length. Either of these schemes would be expensive and the project is not considered feasible at the present time.

There are, no doubt, many other small schemes along the foot-hills which may prove to be feasible, some of which will be investigated during the coming season. It would seem that these areas could be more economically irrigated from the smaller streams than from the rivers.

## CYPRESS LAKE RESERVOIR PROJECT

As stated in the last report, a reconnaissance survey was made of the irrigation possibilities in the valleys of Battle creek and Frenchman river and a report was submitted early in 1920.

During the field season of 1920 a further examination was made of the conditions on both streams and it was decided that on account of the many evidences of alkali in the bottom lands of both valleys, and especially those of the Frenchman, it would be better to develop first the large block of land in the vicinity of Consul, Vidora and Robsart. A main canal was located from the Battle creek outlet of Cypress Lake reservoir to the vicinity of Robsart, a total distance of twenty-two and one-half miles. Levels were run over the section lines of the commanded area and a topographic map



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prepared. The main laterals required were located in the field and the remainder projected on the topographic plan. The total irrigable area under this canal system was estimated at 11,580 acres. An extension of the McKinnon ditch was also surveyed which would add 425 acres, making a total of 12,005 acres for the scheme.

The water supply is the proposed Cypress Lake reservoir, where a storage capacity of 90,000 acre-feet can be created by the construction of dams at the east and west ends of the lake. The flood waters of Battle and Oxarart creeks would be diverted into this reservoir by a canal with a maximum capacity of 1,885 second-feet. The additional works required are, an outlet through the east dam at the Frenchman river and an outlet through the west dam with a short canal to Battle creek. The estimated cost of this storage is \$6.61 per acre-foot. A study of the run-off records from 1912 to 1920 show that with 90,000 acre-feet storage it is possible to supply, in addition to the present demands, about 10,000 acres with the full duty of eighteen inches, or 12,000 acres with a reduced duty of fifteen inches.

The total cost of the project, based on 1920 prices and 12,000 irrigable acres, is approximately \$60 per irrigable acre. In view of the present reduction in prices, the 1920 unit costs are considered high and it is probable that the scheme could be built for \$50 per irrigable acre.

The examination of the soil of this tract proved that in general the top eighteen inches is practically free from alkali. Below this, however, to a depth of about six feet the soil is rather heavily impregnated. The land can, no doubt, be successfully irrigated if the water table can be kept below eighteen inches from the surface. This depends largely upon the character of the subsoil which will be further investigated during the coming field season.

#### NORTH SASKATCHEWAN DIVERSION PROJECT

A history and general outline of the scope of this project is contained in the last annual report. No further field-work was undertaken during 1920.

The proposal for this scheme is to divert the North Saskatchewan and Red Deer rivers to provide water for irrigation and domestic use to an immense tract of land extending from the Berry creek district in Alberta to the neighbourhood of Saskatoon in Saskatchewan. The small amount of reconnaissance which has been completed to date has only served to outline in a general way some of the possibilities of this project.

During 1921 preliminary surveys will be made to determine the feasibility or otherwise of diverting water from the above-mentioned rivers into Buffalo lake as a reservoir, and also the feasibility of locating a canal from Buffalo lake to the irrigable areas. In addition it is proposed to run a system of levels over the township lines of the irrigable tract to obtain a general knowledge of its extent and suitability for irrigation.

#### THE LITTLE BOW IRRIGATION PROJECT

On January 26, 1921, a meeting of the farmers representing owners of land along the Little Bow river bottoms was held in Carmangay, Alberta, for the purpose of organizing an irrigation district. It is proposed to divert water from the Highwood river into the Little Bow river at the town of High River.

In 1919 this branch in co-operation with the Provincial Public Works Department selected a new site for the construction of permanent headworks for the diversion of the 50 cubic feet per second of water which the Provincial Government had been granted to supply the domestic rights on the Little Bow river. This site is located just below the Canadian Pacific Railway bridge at the town of High River.

This proposed district plans to join with the Provincial Government in building these headworks large enough for both diversions. It is proposed that the district



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as a whole shall maintain the headworks and that each farmer shall construct and maintain his own pumping plant for the irrigation of his own land. There are thirty-two separate tracts varying from six acres to two hundred and twenty-five acres in size, all situated less than forty feet above the river. The tracts begin about eighteen miles above Carmangay in section 5, township 15, range 25, west of the 4th meridian, and extend along the Little Bow river to section 3, township 14, range 20, about twenty-six miles below.

The total area is about 2,786 acres.

The landowners have engaged Mr. John Haddon, of Calgary, as their engineer and are making their own surveys.

## DUTY OF WATER

Duty of water investigations were carried on at Brooks, Ronalane and Coaldale as in former years under the general supervision of Mr. W. H. Snelson. Mr. E. E. Eisenhauer collected the data at Coaldale and Mr. A. Hildenbrand of the Canada Land and Irrigation Company operated the experimental plots at Ronalane. The results obtained are detailed in the report submitted for separate publication. The conclusions arrived at are discussed briefly in the following summary.

## DISCUSSION OF THE SUMMARIZED DATA

The duty of water for any locality will vary from year to year, principally in accordance with the amount and seasonal distribution of the precipitation, and to a lesser extent as influenced by temperature and the conditions of soil and subsoil; therefore, in order that the water requirements of crops may readily be compared, from one year to another, or between different localities, it is best to consider that crops annually receive a certain amount of water—precipitation plus irrigation—and designate this amount as the "Total Depth Received."

The next table is inserted to show the climatic conditions prevailing during the years 1914 to 1920 inclusive at the four stations from which data have been taken in writing the general discussion on Duty of Water which follows.

The second table is inserted for the purpose of comparison and shows the average climatic conditions which prevailed during the seven years as compared with long term averages. In both tables the data cover the period April to September, inclusive.

The small chart indicates the different soil conditions at Strathmore, Ronalane, Coaldale and Brooks.

	PRECIPITATION							TEMPERATURE						
	1914	1915	1916	1917	1918	1919	1920	1914	1915	1916	1917	1918	1919	1920
	Feet	Feet	Feet	Feet	Feet	Feet	Feet	F.	F.	F.	F.	F.	F.	F.
Strathmore...	0.17	1.44	1.33	0.85	0.48	1.09	0.74	52.4	52.6	51.6	52.0	52.8	52.9	51.0
Ronalane..	0.38	0.93	1.32	0.50	0.38	0.57	0.45	59.4	57.1	55.2	55.8	56.8	58.4	56.0
Coaldale..	0.57	1.32	1.53	0.72	0.37	0.64	0.84	55.9	55.4	54.5	55.4	55.9	56.7	54.7
Brooks				0.57	0.32	0.70	0.41	55.6	56.3		56.3	58.0	57.5	55.6



	Precipitation		Temperature	
	1914-1920	Long Term	1914-1920	Long Term
	Feet	Feet	F.	F.
Calgary	0.78	1.01	51.44	52.51
Medicine Hat	0.71	0.77	59.33	59.07
Lethbridge	0.83	0.97	54.78	55.61

Calgary-Index for Strathmore long term records 1885-1920; Medicine Hat-Index for Ronalane and Brooks long term records 1884-1920; Lethbridge-Index for Coaldale long term records 1903-1920.

DIAGRAM SHOWING TYPICAL SOILS OF

	Strathmore		Ronalane		Coaldale		Brooks
	Sandy Soil		Fine Sandy Loam Soil		Clay Loam		Fine Sandy Loam
First Foot.....	Fine Sandy Soil to depth varying from 3 to 7 feet		Sandy Loam		Light Clay Loam very uniform has no impervious stratum		Very uniform Soil Very fine sand and silt Light gravel at 12 to 14 feet depth
Second Foot							
Third Foot.....							
Fourth Foot.....	Heavy Clay and gumbo subsoil very impervious		Sand and Gravel.				
Fifth Foot.....							
Sixth Foot.....							

The following table gives a summary of the data collected from the Coaldale, Ronalane, and Brooks stations during the period 1913 to 1920, inclusive. It is not the intention to set forth these figures as representing the exact depths required for the various crops, but rather as showing the results of our investigations to date. The column headed "Yield" is inserted as a useful index to the crops produced, at these three stations. The column headed "Depth" shows in feet the total depth of water received (irrigation plus precipitation).

The *average depth* shown is the average of the depths at the different stations weighted according to the number of years during which records have been taken at each place. The column marked "Average Depth" shows the average for Coaldale, Ronalane, and Brooks.

The data at Coaldale are based on results gained by average farmers irrigating their own fields and cover a period of eight years; the yields at Coaldale have been omitted because they would not be comparable with the results obtained at the other places.

The results at Ronalane are based on plot work carried on consistently for six years. The results at Brooks are based on accurate and consistent plot work covering a period of three years. For Ronalane and Brooks the figures shown represent the average, at each place, of the total depths of water producing the maximum crop yield in each year. For Coaldale the figures represent the average for ordinary crops in each year.



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Crop	Coaldale		Ronaldan		Brooks		Average Depth
	Yield	Depth	Yield	Depth	Yield	Depth	
Wheat		1.54	15.9	1.91	46.5	2.03	1.77
Oats		1.58	91.4	2.15	91.4	1.82	1.85
Barley		1.61	58.5	1.74	57.3	1.98	1.77
Peas			44.0	2.31	52.7	2.29	2.30
Potatoes		0.83	371.0	2.03	293.7	1.72	1.79
Flax					21.1	1.95	1.75
Alfalfa seed					10.7	1.23	1.23
Alfalfa		2.48	3.33	2.08	6.48	2.08	2.19
Grasses		1.89			1.66	1.66	1.82
Sugar beets			1.35	1.66	16.2	1.82	1.82

The average depth noted in the above table indicates quite clearly the total depths required for the crops listed, when grown in that part of Alberta lying south of township 28, and exclusive of that strip of country lying immediately east of the foot-hills.

Assuming, as in previous reports, that eventually all irrigated farms will be seeded down, one-half to alfalfa and one-half to common grains, we have:—

Average depth for wheat, oats and barley.....	1.80 feet.
Average depth for alfalfa.....	2.19 "
Then, total required for entire farm unit.....	2.00 "

With legal duty at 1.50 feet, under this condition we would need to rely on seasonal precipitation to make up the additional 0.50 foot.

The mean summer precipitation at Ronaldan for the past four dry years, 1917 to 1920, inclusive.. . . . .	0.47 foot
The mean summer precipitation at Brooks (same period).. . . . .	0.50 foot
The mean summer precipitation at Coaldale (same period).. . . . .	0.64 foot
Mean of three stations.. . . . .	0.54 foot

We find, therefore, that even during the past four dry seasons in southern Alberta, we have had enough precipitation when added to the legal duty of water to meet the above indicated possible duty.

## REPORT ON DRAINAGE SURVEYS AND INVESTIGATIONS, 1920

By H. R. CROM, B.Sc., A.M.E.I.C.

Field-survey work was commenced in the provinces of Alberta and Saskatchewan about the middle of May and continued well into September. Conditions during this period were very favourable for drainage surveys, as this year might properly be termed the fourth in succession of dry years, and, as a consequence, marked progress was made in the investigations of the projects which were brought before the department from time to time by petition, application to purchase, or otherwise. While, however, dry seasons enable the engineer to more expeditiously carry out his surveys, paradoxical as it may seem, normal and flood conditions are in most cases preferable, as, under such conditions, an engineer, in the study of the many problems arising in connection with the reclamation of land by drainage, is in a better position to obtain definite and reliable information of the wet or flooded conditions than in a dry year when he has to depend on information obtained from settlers or from personal studies and observations of the district.



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## ALBERTA

*Sounding Lake, Townships 36 and 37, Ranges 4 and 5, West 4th Meridian*

This lake lies at the end of a valley almost surrounded by hills, about 12 miles north of the town of Monitor, Alberta, on the Canadian Pacific railway, and has a superficial area of approximately 9,000 acres. The water is shallow, not exceeding one foot in depth at low stage, is muddy and quite useless for stock-watering purposes except in the early spring. There is no apparent outlet from the lake, although Eyehill creek rises within a few hundred feet of it and flows east and north into lake Manitou in Saskatchewan.

Electrolytic bridge tests and the sparse growth of vegetation on land abutting upon the lake indicate the presence of alkali in considerable quantities.

The cost of reclamation is estimated at \$11.50 per acre. As a drainage project this is not looked on with favour, but there is a possibility that the lake may serve as a reservoir in connection with the proposed North Saskatchewan Irrigation Project, which will be investigated during the present season.

*Gough Lake, Townships 35 and 36, Ranges 17 and 18, West of the 4th Meridian*

Gough lake is a shallow body of alkaline water not exceeding two feet in depth and about 12,400 acres in extent. The investigation disclosed that the project is not economically feasible inasmuch as it would cost approximately \$20 per acre to reclaim the land underlying and adjoining the lake and this, together with the fact that the soil after reclamation will probably be of a very doubtful value, renders this scheme undesirable at the present time.

*Farrell and Dowling Lakes, Townships 33 to 36, Ranges 16 to 18, West 4th Meridian*

The area of these lakes, together with some small adjoining and connecting lakes, comprises 14,800 acres. They are situated in a natural depression about 100 to 150 feet below the surrounding hills. The water of Farrell lake and of one of the small lakes is fresh but all the other lakes are quite alkaline. The investigation proved that this is not a feasible or desirable project, but the information furnished indicates that Farrell lake is ideally situated for an irrigation reservoir and that it may be found feasible to irrigate about 15,000 acres of the valley land at reasonable cost.

*Sullivan Lake, Townships 34, 35 and 36, Ranges 14 and 15, West 4th Meridian*

This lake is situated eight miles south of the town of Castor, Alberta, on the Canadian Pacific railway, and is in area about 41,600 acres, with a tributary drainage area of 410 square miles. The water of the lake and soil samples of the lake bed, tested by means of the electrolytic bridge, show the presence of alkali in excess of two per cent.

Alternative schemes of reclamation covering partial and complete drainage were considered for two outlets and it was found that the estimated cost of drainage by the cheaper scheme would approximate \$10.36 for partial reclamation and \$11.04 per acre for complete drainage, but in view of the very doubtful value of the soil for agricultural purposes, when reclaimed, this scheme cannot be recommended. It is possible, however, that Sullivan lake may be utilized as a reservoir in connection with the North Saskatchewan Irrigation Project, as it is feasible to divert water from Battle river, or Red Deer river, to the lake, which is capable of storing 500,000 acre-feet.



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*Lanes Lake, Townships 37 to 39, Ranges 14 and 15, West 4th Meridian*

This lake is situated eight miles north of Sullivan lake and three miles west of the town of Castor, Alberta, on the Canadian Pacific railway, and drains south to Sullivan lake. The lake bed is approximately 2,650 acres in extent, of which about 1,430 acres are periodically flooded, or too wet for cultivation, and 1,220 acres are permanently covered by water. The lake is of a permanent character, being fed by springs, and the water is fresh and clear. Vegetation along the shores is exceptionally good and in places extends well into the water; the land above the water yields an abundance of grass which is cut annually.

The lake bed contains excellent soil which on the surface consists of six inches to one foot of black sandy loam with a stratum of sand six inches to twelve inches thick between that and the clay subsoil. No indications of alkali to any extent were noticed or detected by the electrolytic bridge tests.

The total cost of the project is estimated as \$22,300, or an average cost per acre of \$8.40. As all the resident owners of land affected in any manner by the project are in favour of it, it was decided to make complete location surveys of the scheme during the season of 1921.

*Cygnets Lake*

This lake is situated in township 38, range 28, west of the 4th meridian, and in township 38, range 1, west of the 5th meridian, about six miles due west of the town of Red Deer, Alberta. The level of this lake was lowered some eight or ten feet in 1910 when the Alberta Central Railway Company undertook to construct its grade across the northern extremity of the lake and as a result reduced the superficial area from 4,840 acres to about 1,500 acres.

Complete investigations and surveys of this project were made during the season and it was found that the land underlying and adjoining the lake could be permanently reclaimed at a cost of approximately \$8 per acre. The settlers affected in any manner by the proposed scheme are favourable to drainage and, as the soil of the lake bed is of excellent character, this is a scheme which is now in readiness for construction by the Federal Government, if it should be decided to proceed with it.

*Lac-la-Nonne, Township 57, Range 2 and 3, West 5th Meridian**Lake Majeau, Township 57, Ranges 3 and 4, West 5th Meridian*

Lac-la-Nonne was found upon investigation to comprise about 3,000 acres completely contained within high and steep shores, and soundings taken showed a depth of thirty feet of water without reaching the deepest portion of the lake, so it was not considered further as a reclamation project.

Majeau lake is situated about twenty-five miles west of Busby station on the Edmonton, Dunvegan and British Columbia railway, and fifteen miles north of Gunn station on the Canadian National railway. Its natural drainage is into Lac-la-Nonne by a creek flowing generally through a deep ravine, especially in the lower part of its course.

Partial drainage of the lake by lowering its level two feet would provide sufficient fall for the reclamation of about 220 acres of wet land along the inflowing creeks and would prevent the overflow of some of the meadows which are now periodically submerged. This could be carried out at a cost of about 85 cents per acre benefited, but as the land affected is almost completely alienated from the Crown, the initiative should be taken by the settlers affected.

To completely drain the lake will cost approximately \$31,200, or about \$7.30 per acre. Drainage is therefore economically feasible, but in view of the opposition of



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some of the interested settlers to complete reclamation, and the general indifference of the majority of the others affected, no action will be taken by the department at present.

*Chip Lake, Townships 53 and 54, Ranges 9, 10 and 11, West of the 5th Meridian*

This lake is situated on the main line of the Canadian National railway about eighty miles west of Edmonton and has a superficial area of approximately 18,500 acres. After the freeze-up in December, 1920, soundings of the lake bed were taken from the ice which furnish sufficient information to provide the data for a fairly accurate and detailed working map showing one-foot contours on which a projection of the drainage ditches can be made.

As a result of the limited investigation and details collected, it is estimated that 20,000 acres of land are reclaimable by lowering the level of the lake approximately six feet at a cost of about \$9 per acre. In view of the promising nature of the scheme, it was decided to have a location party thoroughly investigate the project during the season of 1921.

*Magloire Lake*

This scheme is a development of an application received from a private individual to drain. Because of its size and probable cost it was considered too large for private enterprise and it was therefore decided to investigate the possibility of reclaiming the land adjoining and underlying the lake in accordance with the provisions of Part IV of the Drainage Regulations. The lake is situated in township 79, range 21, west of the 5th meridian, about eight miles north of Fahler station on the Edmonton, Dunvegan and British Columbia railway, and ten miles northwest of Kimiwan and Winagami lakes, which were also investigated as drainage projects by this department. The superficial area of the lake is about 1,700 acres and the adjoining marshes and swamps comprise an additional 1,100 acres; the cost of complete drainage is estimated at about \$2.90 per acre, but until the receipt of the report of the Dominion Chemist regarding the analysis of soil samples taken from the lake, it will not be known whether the land underlying the lake is worth reclaiming.

*Winagami and Kimiwan Lakes, Townships 76, 77 and 78, Ranges 18, 19 and 20, West of the 5th Meridian*

These two lakes have heretofore been considered as one project but investigation shows that it is not economically feasible to drain them in the same direction, and separate estimates have therefore been prepared for each project.

Lake Kimiwan is a shallow body of water of about 10,000 acres in extent situated at McLennan on the Edmonton, Dunvegan and British Columbia railway. There is no permanent outlet to the lake, but on occasions of extreme high water, there is an overflow easterly to Reed lake and Peavine creek, thence southerly to Smoky river which is the course followed in projecting the main drainage ditch.

The soil of the lake is a good black loam on a clay subsoil which after systematic drainage will make excellent farm land. The drainage area of Kimiwan lake, including that of Reed lake, is about 100 square miles. It is estimated that to drain this lake would cost \$7.15 per acre, but if the further area of land adjoining Peavine creek is included, the cost per acre will be reduced to \$6.29. The investigation of this project has shown it to be entirely feasible, economical and in the public interest and construction is recommended.

Winagami lake is situated about two miles east of Kimiwan lake and from the plans as at present developed it is considered that its partial drainage, reclaiming about 8,500 acres of land, will be the most efficient method of dealing with it. Until further detailed studies have been made in reference to the control of the level of



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Lesser Slave lake, into which the Winagami lake project would drain, it is considered inadvisable to proceed further with the latter at the present time.

*Athabaska Project, Townships 67 and 68, Range 20 and 21, west of the 5th meridian*

As the result of representations made to the department by the Board of Trade of Athabaska, Alberta, and by Local Union No. 498 of the United Farmers of Alberta, this department made a reconnaissance investigation last season to determine the feasibility of reclaiming by drainage a large tract of swampy land adjacent to the town of Athabaska in the above mentioned townships. It was found that it would be possible to drain some 38,500 acres at a cost of approximately \$3.90 per acre, but before a definite recommendation is made in connection with this project, it is considered desirable to await the result of the tests of the soil which are now being carried out by the Dominion Chemist.

*Flooded Areas in the Vicinity of Lesser Slave Lake*

In recent years much damage has been done, especially in the years 1919 and 1920, by the abnormal height of Lesser Slave lake which caused serious flooding of the low-lying lands adjoining the lake. This was more serious in the year 1920 than formerly, and upon numerous inquiries being made of the department, it was decided to have an investigation made by engineers of the Reclamation Service to determine the cause and to suggest a remedy.

The abnormal rise of the lake is in part, but only to a small extent, due to unusually heavy precipitation; the principal cause is believed to be the silting up of the outlet channel—Lesser Slave river—which for some thirty miles is tortuous and sluggish and quite inadequate to carry off even the natural drainage. The most serious obstruction is just above Saulteau rapids at the eastern end of the section referred to.

As a result of this investigation two principal plans are being considered for lowering the lake level:—

1. To cut through the Saulteau gravel bar to a depth of six feet and a bed width of 100 feet. This work would involve about 102,237 cubic yards of excavation, which at 25 cents would cost approximately \$25,000.

2. To improve the whole course of the river from the lake to Saulteau Landing, making a number of cut-offs to straighten out the winding course of the river. This work would involve the excavation of 881,685 cubic yards, which at 25 cents a yard would amount to \$220,420.

It has been recommended that a further and more detailed investigation of the outlet of the lake be made, as well as of the whole of the flooded area adjoining the lake and lying west thereof in the watersheds of the East and West Prairie rivers.

*Rocky Mountain House Drainage Project*

This scheme is contained in townships 36, 37, 38 and 39, ranges 4, 5, 6 and 7, west of the 5th meridian, and lies to the south and east of Rocky Mountain House, Alberta, being roughly outlined by the following towns and stations, all of which are in the province of Alberta: Rocky Mountain House, Dovercourt, Stauffer, Raven, New Hill, Evergreen, Alhambra, and Condor. The district is served by the branch lines of the Canadian Pacific railway from Red Deer, Alberta, and is about 45 miles from that city.

A reconnaissance of the project was made during last season to ascertain if a feasible scheme could be found to drain this large area of open muskeg which is worthless until drained, unsafe to travel on except when frozen and, in the opinion of the settlers, the chief cause of local early frosts that do considerable damage to the crops each year.



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The attitude of the resident owners was ascertained by means of a petition circulated among them and it was found that all were in favour of drainage and the most interested ones were those who were obtaining the best livelihood under existing circumstances.

The soil of the district is very good and no trace of alkali was found in any part of the tract examined.

The total cost of the project is estimated as \$229,000, which, based on a reclaimable area of 45,400 acres, makes an average cost per acre of about \$7.

Because of the favourable character of the reconnaissance report, it has been decided to make complete location surveys of the scheme during the season of 1921.

### *Big Lake Drainage Project*

This lake, consisting of about 2,550 acres with a depth of approximately three feet, is situated in township 53, ranges 25 and 26, west of the 4th meridian, quite close to the town of St. Albert and about ten miles northwest of Edmonton, Alberta. The lake during the spring and early summer rises to about four feet above its normal level and as a result usually submerges about 6,000 acres of land. The outlet of the lake is Sturgeon river which flows northeasterly through the settlement of St. Albert, and during freshet periods floods portions of the valley through which it flows.

The great majority of resident owners, whose lands would be affected by the drainage of the lake, are strongly in favour of reclamation, and the only persons who are opposed to the scheme are three owners of land who favour the revival of a scheme for making a summer resort of the lake because, primarily, of its proximity to Edmonton.

It is estimated that the lake may be completely drained at a cost of \$221,000, making the average cost per acre of land benefited approximately \$36.60. A combined scheme of drainage and irrigation is quite feasible and is desirable in this case as it would convert the shallow, unsavoury, mosquito breeding swamp into one of the richest and most productive tracts of land in Western Canada. The situation of the land right on the railway and near the capital of Alberta, the rich nature of the soil well drained and irrigated, is ideal in all respects for intensive market gardening and the increase in value of the land affected, when compared with the cost of reclamation, would undoubtedly make the project a very profitable one for all concerned. A plan for partial reclamation was also worked out but would not be economically feasible.

### SASKATCHEWAN

*Waterhen Lakes Drainage Project, Townships 44, 45A and 45, Ranges 21 and 22, West*

### *2nd Meridian*

A drainage district, designated as No. 15, was created May 31, 1920, under the drainage laws of the province of Saskatchewan, resultant upon the investigation carried out by the Reclamation Service the preceding year showing the project to be in every respect desirable. Tenders were called for construction of the drainage works and on the 26th October, 1920, the contract was let to the Lount Engineering Company, Limited, Winnipeg, at a unit cost of 21.9 cents per cubic yard for earth work. The total cost of the scheme is estimated as \$169,195, which figures out at approximately \$12.20 per acre reclaimed. The actual work of construction has only commenced and it is expected that the scheme will be completed by the fall of 1922.



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*Ponass Lake Extension Drainage Project, Townships 37 to 41, Ranges 15 to 17, West 2nd Meridian.*

A reconnaissance of this project was made with a view to adding an additional area to the original scheme investigated in 1919, but it was found that this could not be accomplished as it would decrease the percentage of Crown lands below the necessary 50 per cent.

*Whitesand River Project*

This scheme is in township 32, ranges 9 and 10, west 2nd meridian, and is the development of an application received by the department for the drainage and purchase of one quarter-section of land under the provisions of Part I of the Drainage Regulations.

Two schemes were investigated, one for partial reclamation to improve the existing lay lands and the other to permanently reclaim all land affected. Partial reclamation was found possible at a cost of \$2.20 per acre, and complete reclamation at a cost of \$5.40 per acre.

Before a definite decision in this case can be reached, it will be necessary to carefully examine the surface soil, as considerable of the area is strewn with small stones and boulders. Otherwise the scheme is feasible and desirable.

*East Moose Range Project*

A reconnaissance survey was made of the district lying east of the line between ranges 10 and 11, west 2nd meridian, and bounded by the Saskatchewan river on the north, the Sipanok channel on the east, and the Carrot river on the south, comprising altogether about 600 square miles.

While certain portions of this large tract were found to be susceptible of economical drainage, it is considered, on account of the inaccessibility of the district, that drainage under present circumstances is not in the public interest.

*Centre Moose Range Drainage Project Townships 49 and 50, Ranges 11, 12 and 13 West 2nd Meridian.*

During the field season of 1919 a reconnaissance survey of this project was made and in view of the favourable nature of the report submitted, it was decided to have a complete location survey of the project made, which was accordingly arranged for and carried out during the season of 1920.

It was found impossible to include in the proposed drainage district all of the land owned by settlers desiring drainage and, unfortunately, a considerable area of reclaimable land had to be left out in order that the Federal Government would be in control of 50 per cent of the total area and thus be enabled to undertake its drainage under Part IV of the Drainage Regulations.

Complete plans of the scheme have been drawn up and schedules of assessment prepared covering all the land that will be benefited by the scheme and in arriving at the assessment due consideration has been given the various degrees of benefit which will probably result to the land after reclamation. The total area is 107,400 acres and the total cost is estimated at \$263,600, which permits of the land being reclaimed at the rate of \$2.57 per acre.

This is one of the most favourable drainage projects yet investigated by the department and it is the hope of the settlers that the Dominion Government will undertake the construction of the drainage works in the near future. This project is strongly recommended for construction.



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*Moose Range West Project*

This project is situated in townships 48 and 49, ranges 14, 15 and 16, west 2nd meridian, and as regards nature of the soil, timber and other details, it closely resembles the country lying to the east in the Centre Moose Range District. As in the latter, the settlers are very much in favour of it.

It is estimated that 16,700 acres can be reclaimed at a cost of about \$3.10 per acre. This is a very favourable rate for complete reclamation of land which is considered as fairly "close in." This project presents no engineering difficulties, is very desirable and the investigation fully indicates its economical feasibility. It is strongly recommended for construction.

## MANITOBA

*Whitewater Lake*

This lake is situated in townships 3 and 4, ranges 21 and 22, west of the Principal meridian, and contains some 19,600 acres, including the adjoining low-lying shores. The investigation disclosed that it would be prohibitively expensive to construct works to completely drain this lake in view of the fact that there is no natural outlet. The cost of reclamation is estimated as \$583,000, or approximately \$30 per acre, and in this connection it is to be noted that improved farms in the vicinity may be purchased for \$25 per acre, while prairie land sells at \$18 per acre. This, together with the poor class of soil in which alkali of a considerable quantity is present, makes this scheme undesirable.

## PRIVATE DRAINAGE PROJECTS

During the field season of 1920, engineers of the Reclamation Service investigated and inspected fifty-five private drainage projects, of which four were cancelled on voluntary abandonment by the applicants and six, after investigation, showed that they were not feasible under the provisions of Part 1 of the Drainage Regulations. During the year April 1, 1920, to March 31, 1921, 127 applications for private drainage projects were received, but of these and former applications 120 were cancelled, chiefly for non-compliance with the Drainage Regulations or on voluntary abandonment. It is expected that twenty-five of the new applications will be investigated during the present field season and also that some twenty-five projects, authorized and under construction, will require inspection to ascertain what progress has been made in construction of works.

## INTERNATIONAL WATERWAYS TREATY

The measurement and apportionment of the waters of the St. Mary and Milk rivers were carried out during the past season under the provisions of an interim order made by the International Joint Commission pending a final decision on this important matter. As in previous years, an engineer of the Reclamation Service acted in co-operation with an engineer of the United States Reclamation Service in the measuring and apportioning of the waters and the collection of data in connection therewith.



## PART V

# DOMINION WATER POWER BRANCH

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### REPORT OF THE DIRECTOR AND CHIEF ENGINEER OF WATER POWER, J. B. CHALLIES, C.E., M.E.I.C.

Natural resources may be divided roughly into three classes: exhaustible, semi-exhaustible and inexhaustible. Amongst the first are coal, oil, natural gas and peat produced by the slow evolution of centuries and as these are used up they are not reproduced and their eventual exhaustion is, therefore, inevitable. Amongst the semi-exhaustible are timber; this resource can be reproduced in periods of time within the bounds of practical measures. Water resources are inexhaustible, travelling in the continuous circle ocean-vapour-rain-river and back to ocean again.

Officials charged by the state with the care of these resources have to adopt a course consistent with the nature of the resource with which they have to deal. This course must be dependent upon a policy having adequate and appropriate legal authority, physical foundation and administrative execution.

*Legal authority.*—Water has probably been the cause of more litigation than any one single natural resource in the history of the world. It is used for domestic purposes, agriculture, navigation, power, to mention but a few of the principal uses, and the law regarding it had its beginning in antiquity and has grown up through the slow process of time by a change here, an addition there, as experience or new uses developed. It happens then that the rapid recent development of the use of water for power purposes due to the strides made in the science of electric generation and transmission has found old established water law unready and inadequate for the new problems, and most of the nations of the world are now treading a difficult path through old laws, precedents and customs to seek for a law that will give authority and facilities commensurate with the importance and needs of modern water-power development without depriving other users of water of their long recognized and essential rights.

*Physical foundation.*—Any policy for utilization of a natural resource must fail that is not founded on nature; in other words the evolution of a successful policy for the development of water-power depends on adequate knowledge of the laws of nature and the behaviour of water, rivers, streams, lakes in their natural state. Nature can be interfered with within certain limits, but what these limits are can only be determined by careful investigation and study by those skilled in such matters and who investigate and record the ever-changing regimen of their element from season to season and from year to year.

*Administrative execution.*—The administrator seeks to perform his duties to the state so that the public interest may be best served; that is to say, he seeks the greatest good to the greatest number and injustice to none. This goal is not easy of attainment and many steps, some in the wrong direction, will be taken before even the vicinity of the goal is reached.



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The foregoing briefly outlines the genesis of the functions exercised by the Dominion Water Power Branch and indicates the basic principles which prompt it in the initiation of legislation, in the carrying on of water resources investigations and in the framing of administrative regulations.

The first legislation giving specific legal authority for dealing with water-powers under federal jurisdiction was contained in section 35 of the Dominion Lands Act passed in 1908. This section was amended in 1914 and repealed in 1919 when the Dominion Water Power Act provided independent water-power legislation. The systematic study and investigation of water-power and related subjects began in 1911, in which year this branch of the department of the Interior was established. The administration has hitherto been carried out under regulations framed in 1911, but these regulations, though sound in principle, have proved inadequate and sometimes unsuitable in detail; new regulations framed after several years of research and study of data from world-wide sources are now practically complete and, it is believed, will be found sound in principle and applicable in practice.

#### ORGANIZATION AND SCOPE

Until the Dominion Water Power Branch was created there was no channel available by which facts bearing upon water-power development could be collected and freely and impartially made available to the public. The continuance of the branch with its present organization and scope is designed to provide a channel for the collection and distribution of all the material information necessary to ensure that the water-power resources of the Dominion shall be utilized in a manner to best serve the public interest.

The fiscal year ending March 31, 1921, covers a period of marked expansions in the activities of the branch. A brief summary of the principal features of the year's work follows.

#### DOMINION POWER BOARD

The Dominion Power Board was created by Order in Council in April, 1919; Chairman, the Minister of the Interior, Vice-Chairman, the Assistant Deputy Minister of Public Works. The members are all officials of Government departments, Federal or Provincial, closely connected with the investigation, administration, production or use of the fuel-power resources of the country. The detail personnel is as follows:—

Hon. Sir James A. Lougheed, K.C.M.G., Minister of the Interior, Chairman.

Mr. Arthur St. Laurent, Assistant Deputy Minister, Department of Public Works, Vice-Chairman.

Mr. H. G. Acres, Chief Hydraulic Engineer, Hydro-Electric Power Commission of Ontario.

Mr. Arthur Amos, Chief Engineer of the Hydraulic Service of the Province of Quebec.

Mr. W. A. Bowden, Chief Engineer, Department of Railways and Canals.

Dr. D. B. Dowling, Geologist, Mines Department.

Mr. J. B. Challies, Director and Chief Engineer of Dominion Water Power Branch, Department of the Interior (Secretary).

Mr. B. H. Fraser, Chief Engineer, Marine Department.

Mr. B. F. Haanel, Chief Engineer, Fuel Testing Division, Mines Department.

Mr. O. Higman, Chief Electrical Engineer, Department of Trade and Commerce.

Col. C. N. Monserrat, Consulting Engineer, Department of Railways and Canals.

Mr. John Murphy, Electrical Engineer, Board of Railway Commissioners of Canada,

Mr. W. J. Stewart, Consulting Engineer, Department of External Affairs.



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The board was organized as an engineering body for the study and reporting upon of the fuel-power problems of Canada, and for the advising of the Dominion Government in connection with such technical matters as might be referred to the board from time to time. In accordance therewith it has made reports during the year on various questions, such as the export of electrical energy, the refund claim of the Hydro-Electric Power Commission of Ontario, and the deep-water canalization and power development of the St. Lawrence river.

In addition to the above the board has been kept closely informed on all proposals affecting the present or future status of international waters, more especially the question of diversions from the Great Lakes and the Niagara and St. Lawrence rivers. Besides this the work of collecting and collating all available data on the hydraulics of the St. Lawrence river has been continued throughout the year, a compilation that when completed will be of the greatest value in connection with the consideration and solution of the St. Lawrence problem.

## LAKE OF THE WOODS CONTROL BOARD

The Lake of the Woods Control Board, composed of the following Dominion and Provincial representatives: W. J. Stewart, Chief Hydrographer of the Naval Service; J. B. Challies, Director and Chief Engineer of Water Power; H. G. Acres, Hydraulic Engineer of the Hydro-Electric Power Commission of Ontario; and L. V. Rorke, Director of Surveys, Department of Lands and Forests of Ontario, has by virtue of an Order in Council dated January 21, 1919, continued its duties in the regulation of the levels and outflow of lake of the Woods.

The arrangements initiated by the Dominion Water Power Branch for the gathering of hydrological data in the watershed have proved invaluable, as the board is now deriving the benefit from comprehensive basic records extending over a period of several years. This has to a great extent been responsible for the results secured during the past year when lake elevation was held within a range of less than one foot, and at the same time full provision was made for coping with high spring inflow and also for ensuring the needs of power developments on the Winnipeg river.

From July to March, exceptionally low runoff conditions were encountered, but through prompt action in conserving the outflow practically no draught on storage was found necessary.

To ensure permanent status to the board and its functions, concurrent legislation was introduced in the Parliaments of Canada and Ontario. This legislation has been passed by the Dominion but action in the Ontario House is still pending.

## WATER-POWER REGULATIONS AND LEGAL RESEARCH

The study of water-power legislation and administration in all countries which have given serious attention to this subject has been continued as in the past few years and the services of a technical translator have been fully occupied in translating the water-power laws of Europe. The work has now reached the stage of presenting in English in a uniform manner the basic laws relating to water rights in general and those in particular by means of which water-power is used, which have been developed through the various legal systems of the civilized world. These laws are now available for comparative study and afford a large and fruitful field for further research.

Many of the regulations dependent upon these laws have also been collected and where necessary translated, but much more remains to be done in this direction as well as in the collection of examples of concessions and licenses under the provisions of which water-power is actually being developed.



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The new regulations under the Dominion Water Power Act, the field covered by which was briefly described in the last annual report of this branch, have been further revised and amended in the light of more recent investigations and are now substantially complete with the exception of a few important matters such as the amount of the rentals to be paid and the principals on which they are to be based, also the compensation which should be allowed when the license is terminated with or without the consent of the licensee or expires without having been renewed.

#### BRITISH COLUMBIA WATER-LANDS REGULATIONS

In the Railway Belt of British Columbia, the waters and water-powers, although they belong to the Dominion, are administered by the provincial authorities (except those within the Dominion parks) under their Water Acts, and in order to enable those who have been granted water privileges by the province to have access to the Dominion lands which they require to use or occupy in the exercise of their water rights, the British Columbia Water-Lands Regulations were adopted by Dominion Order in Council in June, 1918.

The general principles underlying these regulations are, that application for a water privilege and application for the land required in connection with it should be made at the same time, so that during the interval which must necessarily elapse before the water license can be issued by the province, the land which will be required by the applicant in carrying out his works may not be disposed of in such a way as to prejudice his prospective rights, and, after the water license has been issued, to grant the licensee only such rights of access and occupation as are necessary to him, thus making the land permit complementary to the water license.

The Water Rights Branch of the Provincial Government gives every assistance in carrying out the regulations and supplies full information regarding all water privileges applied for or granted which affect Dominion interests.

Due to this co-operation satisfactory progress is now being made with the large number of cases which could not be dealt with until the regulations had come into force, as well as with new applications.

#### WATER RESOURCES INVENTORY

The systematic analysis of the water resources of the Dominion has proceeded throughout the year in accordance with the principles of the inventory. In co-operation with the officers of the Hydro-Electric Power Commission of Ontario an analysis of the undeveloped water-power resources of Ontario has been carried well towards completion. A similar analysis has been completed in British Columbia in co-operation with the Water Rights Branch of the Provincial Government. In the other provinces similar work is systematically proceeding and at the present time a considerable proportion of water-power resources data of the Dominion is available in standardized and usable form for whatever purpose required. A continuous effort is being made to keep these data authentic and up-to-date.

The fact that various Federal and Provincial departments have adopted the system has greatly facilitated the interchange of water resources information. This is a feature, the value of which will be appreciated more and more as the principles of the system are more widely adopted.

It may be mentioned that after thorough investigation by a specially appointed sub-committee in Great Britain, the principles of the system have been recommended to the Water Power Resources Committee of the Imperial Board of Trade for adoption for the compilation and recording of the water and power resources data of the United Kingdom.



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## WATER-POWER RESOURCES OF CANADA

Careful computation has been made of Canada's water-power resources. While these have been exhaustively analyzed in so far as the information available will permit, it should be kept in mind that only very meagre data are to hand for many districts and for many rivers.

The figures given hereunder are based upon rapids, falls and power sites of which the actual existent drop or the head possible of concentration, is definitely known or at least well established. Innumerable rapids and falls of greater or lesser power capacity are scattered on rivers and streams from coast to coast which are not as yet recorded, and which will only become available for tabulation as more detailed survey work is undertaken and completed. This is particularly true in the more unexplored northern districts. Nor is any consideration given to the power concentrations which are feasible on rivers and streams of gradual gradient, where economic heads may be created by the construction of power dams, excepting only at such points as definite studies have been carried out and the results made matters of record.

In brief, the figures hereunder are based on definite rapids, falls and power sites, and may be said to represent the minimum water-power possibilities of the Dominion.

The power estimates have been calculated on the basis of twenty-four-hour-power at eighty per cent efficiency, on the basis of "Ordinary minimum flow," and "Estimated flow for maximum development." The "Ordinary minimum flow" is based on the averages of the minimum flow for the lowest two consecutive seven-day periods in each year, over the period for which records are available. The "Estimated flow for maximum development" is based upon the continuous power indicated by the flow of the stream for six months in the year. The actual method to determine this flow is to arrange the months of each year according to the day of the lowest flow in each. The lowest of the six high months is taken as the basic month. The average flow of the lowest seven consecutive days in this month determines the maximum for that year. The average of such maximum figures for all years in the period for which data are available is the estimated maximum used in the calculation.

This estimated maximum development is based upon the assumption that it is good commercial practice to develop wheel installation up to an amount the continuance of which can be assured during six months of the year, on the assumption that the deficiency in power during the remainder of the year can be profitably divided by the installation of fuel power plants as auxiliaries. The correctness or otherwise of this assumption for any particular site can only be definitely settled by the careful consideration of all circumstances and conditions pertinent to its development. The method, however, enables us to make a fairly satisfactory overall estimate of the maximum hydraulic power available, as distinctive from the estimated ordinary minimum power available.

The recorded power available throughout the Dominion under conditions of ordinary minimum flow and within the limitations set out in the foregoing, is 18,255,000 horse-power. The water-power available under estimated flow for maximum development, i.e., dependable for at least six months of the year is 32,976,000 horse-power.

There are installed throughout the Dominion water-wheels and turbines to the extent of 2,471,000 horse-power. However, it would not be correct to place this figure in direct comparison with the minimum or maximum available power figures quoted above and therefrom deduce the percentage of available water-power resources developed to date. An allowance must be made for the average ratio between the water-wheels installed and the power available.

An analysis of the water-power plants scattered from coast to coast, concerning which complete information is available as to turbine installation and satisfactory



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information as to stream flow, gives an average machine installation 30 per cent greater than the six-month flow maximum power. Applying this, the figures quoted above therefore indicate that the at present recorded water-power resources of the Dominion will permit of a turbine installation of 41,700,000 horse-power. In other words, the present turbine installation represents only 5.9 per cent of the present recorded water-power resources.

In spite of the outstanding facts that financial and commercial conditions are still far from normal and that costs of construction are almost prohibitive for all but absolutely necessary undertakings, there has been during the past year, and is now, marked activity in hydro-power construction. This has resulted from a variety of causes, principal among which is the lack of native coal in the central industrial district and the fortunate location of economic water-power sites to industrial centres.

The total hydro-power development installed during the past year or now under construction represents approximately 560,000 horse-power of installed capacity. This figure includes only the initial installation of plants under construction, not their ultimate designed capacity. It is evidence of the manner in which the water-power resources of the Dominion are being put to effective and productive use.

It will be profitable to consider the history of water-power utilization in Canada during the past few years in conjunction with the present activity with a view to making some reasonable forecast of its probable future growth. Should the rate of water-wheel installation during the past fifteen years be maintained, there will be installed in 1925, 3,360,000 horse-power; in 1930, 4,110,000 horse-power; in 1935, 4,860,000 horse-power; and in 1940, 5,600,000 horse-power. In view of the increasing appreciation of the advantages of hydro-power combined with the fortunate location of ample supplies within easy transmission distance of practically every great industrial centre throughout the Dominion, there is every reason to anticipate that the rate of growth in utilization will be accelerated rather than retarded. Reference to the foregoing totals of water-power available will indicate that this anticipated increase in utilization will not seriously reduce the total reserves. Canada possesses sufficient reserves of water-power to meet all anticipated demands for many years to come.

In order to ensure the most beneficial utilization of these reserves and to provide intelligent guidance for their development, two essentials are required:—

First.—An accurate knowledge of the location, capacity and the engineering and economic possibilities of development of the water-powers throughout the Dominion, together with their relationship to other natural resources of mine and forest, to industrial centres and opportunities, to transportation system—rail and navigation, to coal and fuel supplies, to irrigation, drainage and reclamation projects, to alternative sources of power and to market for and uses of power in general.

Second.—A sound governmental administration policy designed to protect the public from inadvisable and ill-designed power schemes and to provide for reasonable regulation and revision of rates and rentals, and at the same time to ensure satisfactory guarantees for the encouragement of legitimate investment in hydro-power enterprises.

True conservation of our water-power resources which are inexhaustible through use lies, not in withholding them from development, but in their efficient utilization in the public interest, for the economic exploitation of our other natural resources, and for the conservation of our exhaustible fuel supplies.

The water-power now developed in Canada represents an investment of \$475,000,000. In 1940, should the rate of growth in installation during the past fifteen



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years be continued, this investment will have grown to over \$1,000,000,000. The present development represents an annual equivalent of 18,500,000 tons of coal which, valued at \$8 per ton, represents \$148,000,000. In the year 1940 these annual figures will, with the foregoing assumption, have become 42,000,000 tons and \$336,000,000. These figures are striking evidence of the outstanding importance and necessity of an intelligent administrative policy governing the development of our water-power resources.

## DOMINION HYDROMETRIC SURVEY

By a readjustment of the responsibilities of the Dominion Water Power Branch and the Reclamation Service, the hydrometric surveys of Alberta and Saskatchewan were by an Order in Council, dated July 19, 1920, transferred to the Dominion Water Power Branch. This has resulted in a consolidation of the stream measurement work of the department and the formation of a Dominion Hydrometric Survey to cover all Canada.

This additional work has increased the scope of the branch activities and has not only permitted of maximum efficiency in both administration and field operations but has created one central agency for the compilation and dissemination of stream flow data.

During the early portion of the past year, runoff throughout Canada was of normal amount, but as a result of deficient precipitation in later summer and autumn the runoff in the Prairie Provinces and in Ontario diminished rapidly and in several localities gave rise to an acute power shortage.

Stream measurement work in British Columbia was carried on under the direction of Mr. R. G. Swan, District Chief Engineer, at Vancouver, in the closest co-operation with the Water Rights Branch of the Provincial Government. At the request of the latter, 40 additional stations necessary to provincial irrigation projects were established in the Kamloops and Kootenay districts. As an assistance to the Department of Indian Affairs in the investigation of water rights on Indian reserves, necessary stations were maintained. In all a total of 183 stream measurement stations were in regular operation while miscellaneous measurements were secured at 63 stations.

In Alberta and Saskatchewan, stream measurement work has been carried on under the direction of A. L. Ford, District Chief Engineer at Calgary. The closest co-operation has been maintained with the officials of the Reclamation Service, under whom the work was previously and ably administered. During the year 308 regular gauging stations and 61 miscellaneous gauging stations were maintained. In addition the annual flood prediction survey was made in the Bow River watershed and a rating made of the Calgary power plant at Kananaskis.

Under the direction of C. H. Attwood, District Chief Engineer at Winnipeg, the work in Manitoba has been carried on as in the previous years. Additional to this has been the work in Ontario to the west of lake Nipigon, which for economical operation can best be handled from the Winnipeg office. During the winter invaluable field investigations were made of runoff and ice conditions on the Nelson river at Whitemud falls. A detailed investigation was also made of Lac Seul supply factors and of the storage range necessary to regulation. Regular gauging stations maintained throughout the year numbered 72, while miscellaneous stations numbered 52.

In Ontario stream measurement work has been carried on under the direction of S. S. Scovil, District Chief Engineer at Ottawa, in close co-operation with the Hydro-Electric Power Commission of Ontario and also with many private corporations interested in various phases of power development. To meet the requirements of prospective developments, field operations have been extended to include the more important rivers draining into Hudson bay, and stations in regular operation now total 60.



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In New Brunswick, Nova Scotia, and Prince Edward Island, the hydrometric surveys have been continued as in the previous year under the direction of K. H. Smith, the District Chief Engineer at Halifax. In each province the fullest measure of co-operation has been maintained with the provincial authorities. The total number of regular stations in operation was 45, while miscellaneous records were secured at various other locations.

#### DOMINION WATER POWER AND STORAGE SURVEYS

Power and storage investigations were carried out in various parts of the Dominion by the department during the past year. These activities were for the most part confined to the more active prospective developments. Office studies with regard to the analysis of water-power possibilities throughout the Dominion were also continued throughout the year.

In the Yukon Territory an investigation of the power possibilities of the Mayo district was carried out, embracing Mayo river, Janet creek and Fraser falls on the Stewart river. An adequate supply of economic power is essential to the development of the extensive mineral resources of the district. The investigations made would indicate ample power resources being available.

In British Columbia in conjunction with the collection of fundamental stream flow data, an extensive analysis of the water-power resources of the province has been actively continued in co-operation with the Provincial Water Rights Branch and in accordance with the standard principles of the **Water Resources Inventory**.

In Alberta a detailed investigation was made of the lower fifteen miles of the Kananaskis river to ascertain the amount of storage that might be impounded for the purpose of increasing the flow in the power reach of the Bow river over the period of low flow conditions. At the Bow Falls power site on the Bow river at Banff which had been previously investigated, additional surveys of the left bank were made during the year to provide for alternative designs and estimates. Inspections were also made of the power possibilities of the Raven river in section 22, township 25, range 7, west of the 5th meridian, and the Sturgeon river in sections 31 and 32, township 55, range 23, west of the 4th meridian.

In Saskatchewan an inspection was made of a proposed power site on the Assiniboine river, near Fort Pelly, to determine the feasibility of developing hydro-electric power for transmission to and use in Yorkton and other nearby towns.

In Manitoba an investigation was made of the possibility of developing power for small saw-mill purposes on the Little Bull Head creek, a stream flowing into lake Winnipeg from the west. A reconnaissance investigation was also made of the power possibilities of the Red Deer river between Red Deer lake and lake Winnipegosis to determine the feasibility of developing power for the operation of a pulp and paper mill.

In Ontario a reconnaissance power survey was made of the lower part of the Steel river between Mountain lake and lake Superior, and also of the lower part of the Pic river. A study was made from the existing data of the inflow and outflow of Lac Seul on the English river to determine the regulated outflow available from the lake if properly controlled and regulated by a dam built a short distance below the lake at Ear falls. The comprehensive analysis of the developed and undeveloped water-power and storage resources of the province was actively continued in co-operation with the **Hydro-Electric Power Commission of Ontario**.

In Quebec a systematic analysis of the water-power resources, developed and undeveloped, was continued, based upon the extensive investigatory work carried on by the Quebec Streams Commission and upon other existing sources of reference, both Federal and Provincial.

In New Brunswick general power and storage surveys were carried out during the year on the Miramichi and Shediac rivers. In addition, detailed contour surveys



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were made of the storage basins and power sites on the Lepreau and Musquash rivers in co-operation with the New Brunswick Electric Power Commission who desired accurate information for the design of their developments on these rivers.

In Nova Scotia general power and storage investigations were carried out on the Ship Harbour river, Tangier river, Musquodoboit river, Salmon river—Port Dufferin, Archibald brook, Isaacs Harbour river, Metegan river, Tusket river, Jordan river, Tidney brook, Economy river, Jeffer's brook, Grosses Coques brook, McLellan lake stream, and Avon river. In addition detail contour surveys were carried on in co-operation with the Nova Scotia Power Commission in connection with projected developments on East river, Sheet harbour and Bear river. The commission was also assisted in the location of their transmission line from St. Margaret bay to Halifax. Small power sites were also investigated and reported on at Parks falls, Pictou county, Nappan river, Kennington Cove brook, river Tillard and Eel lake brook, Grand Manan.

In Prince Edward Island power and storage surveys were deferred until the stream measurement work had been brought well under way.

## DOMINION LAND SURVEYS

Dominion land surveys of overflowed lands as they affect the administration of water-power were carried on throughout the year under the direction of Mr. T. H. Dunn, D.L.S.

The season of 1920 was spent in completing the survey of the lower Pinawa channel, commenced in 1919, to its outlet in Lac du Bonnet and making a survey of the south and east shores of Lac du Bonnet. The survey of the lake was completed from the east boundary of section 12, township 17, range 12, E.P.M., south and west around the east and south shores of the lake to the north boundary of section 35, township 15, range 11, E.P.M., and including both sides of Bird river as far as the first fall.

The boundary of the area to be reserved around Lac du Bonnet for flooding purposes is being located as near the 830 contour as is consistent with the posting of the traverse corners and the consequent necessity of making these corners as few in number as possible.

During the season 56 miles of chained traverse and 59 miles of section line were run, making a total of 115 miles. This involved the planting of 500 standard and 40 short standard posts, or a total of 540 posts. Of this number 84 were placed at section corners with pits and mounds and 456 were placed at traverse corners. Where traverse corners coincide with section corners the posts are not marked with the traverse number.

## INVESTIGATION INTO THE UTILIZATION OF OFF-PEAK CENTRAL STATION POWER

The investigatory work which has been under way during the past year looking to the increased industrial use of off-peak central station power has been productive of results of definite value. Considerable success has been achieved in the development of an electrolytic cell which it is considered will possess marked advantages in the industrial field. Further experimental work is necessary to confirm the preliminary studies in this connection. Other lines of study are receiving continuous attention. Over ninety-one per cent of the installed central station primary power in Canada is water-power. Every step taken towards the end of bettering the load factor of this central station power means a more efficient utilization of our water-power resources. The lines of study under way have this end in view.



## PUBLICATIONS

Annual Reports, Water Resources Papers, which embody the results of investigations of the various engineers of the branch, and special pamphlets and bulletins relating to water-power are prepared for distribution to the public.

The following reports, etc., were prepared and published during the year:—

1. Annual Reports of the Branch for the fiscal years ending March 31, 1918, and March 31, 1919, combined in one volume.
2. Report on Water Powers of the Prairie Provinces. This is part nine of the above Annual Report in pamphlet form.
3. Water Resources Paper No. 25—Report of the hydrometric survey work in British Columbia for the climatic year 1918-19. Continues the hydrometric work to September 30, 1919.
4. Water Resources Paper No. 26—Report of the hydrometric survey work in Manitoba for the climatic year 1918-19. Continues the hydrometric work to September 30, 1919.

*Report now in Press*

1. Annual Report of the Branch for the fiscal year ending March 31, 1920.

*Reports in course of preparation*

1. Water Resources Paper No. 28—Report of the hydrometric survey work in Ontario for the climatic year ending September 30, 1920.
2. Water Resources Paper No. 29—Report of the hydrometric survey work in the Maritime Provinces for the climatic year ending September 30, 1920.
3. Water Resources Paper No. 30—Report of the hydrometric survey work in British Columbia for the climatic year 1919-20. Continues the hydrometric work to September 30, 1920.
4. Water Resources Paper No. 31—Report of the hydrometric survey work in Alberta, Saskatchewan and Manitoba for the climatic year 1919-20. Continues the hydrometric work to September 30, 1920.